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Specification and Procurement of Manufacturing Materials

Methods employed at the Westinghouse Plant

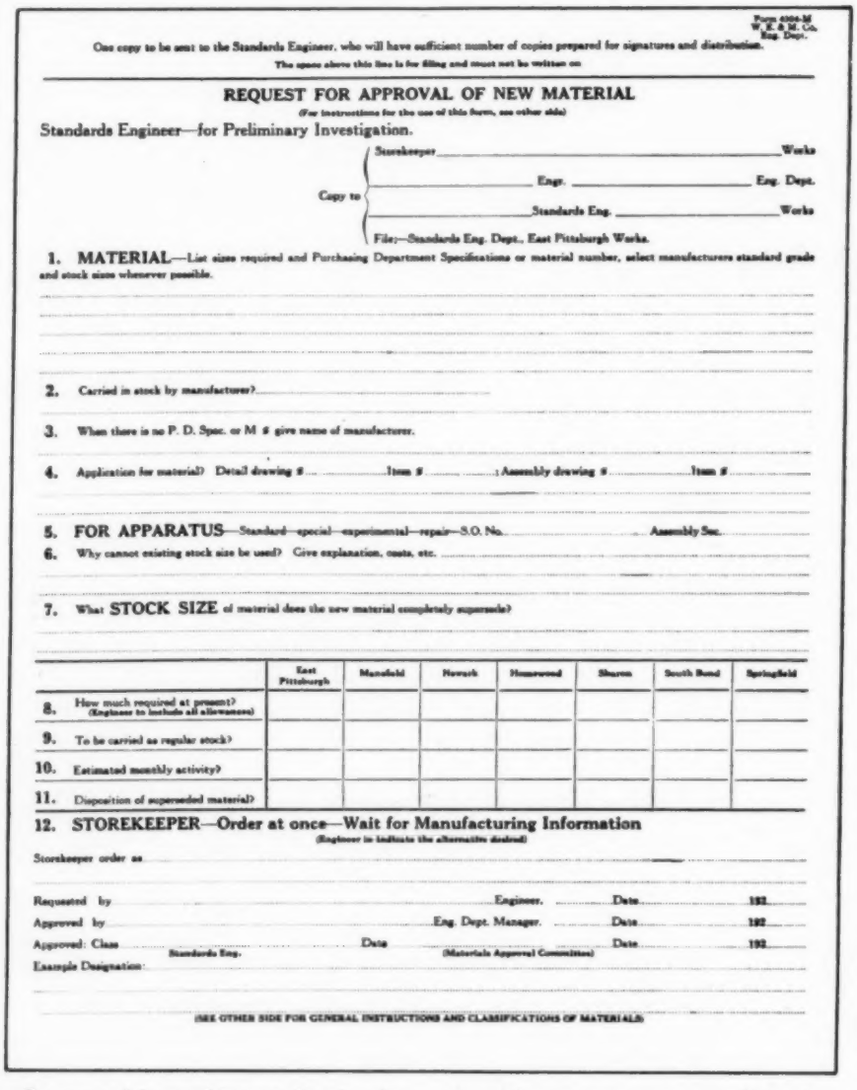
By D. F. Miner
Manager, Material and Process Engineering Department
Westinghouse Electric & Manufacturing Company

RESPONSIBILITY for the specification of materials in the product rests with the design engineer at the plant of the Westinghouse Electric & Manufacturing Company. The design engineer is held responsible for the ultimate performance of the machine in the hands of the customer, and his influence, therefore, dominates anything that enters into the make-up of the machine. In the process of first choice and specification of materials, many hands usually enter, from the research engineer to the purchasing director and director of sales. But this fact does not relieve the designer of his charge, and no new material is put into a machine until the designer has been satisfied that it will meet the conditions of service. The design engineers are specialists in the class of machinery which their respective groups design. They are expected to know the operating conditions of the completed machine, and their prime job is to know the product from the results that it is intended to get. But, at the same time, they are also expected to keep fairly conversant with the properties of materials from which the product is made. However, it is recognized that the designer cannot also be a metallurgist, chemist, or physicist. He cannot be familiar with the latest progress of the market and the availability of materials, nor can he take the time to follow out physical tests and investigations to determine why a given material has failed in service. Other means of aiding him on these points have, therefore, been provided through a research staff, a "materials and process department," and a "standards department." In addition, the purchasing department is in touch with sources of commercial materials, and is continually receiving data on new materials being offered on the market. This is made available through various channels to the design engineer. Back of all this is also the shop or manufacturing department, which has to meet the difficulties of machining, heat-treating, or finishing a given material. There is the further possibility that a machine incorporating the new material may not be as salable, or it may have additional sales value, and the sales department may thus have an interest in the change. Due to the fact that any change in the materials is of so widespread interest, each design section which handles the design of any important machine has a regular committee for passing judgment on any new material to go into the product. This committee consists of the design engineer, the sales engineer, and one man from the works department. It reviews the economic factors and decides if it is worth while to spend more money to improve a given material situation; or, in the case of savings to be effected, whether the final result will be just as good, or better, than the original product. Finally, before a decision is completed on a new material that introduces an important change, a plant "materials approval committee" goes over the specification for approval. This general committee consists of the chief mechanical engineer, the chief electrical engineer, and the manager of the materials and process department.

Choice of the proper materials for the product is being more and more recognized as of vital importance. The author of this article shows that although responsibility for the material rests on one capable executive, the choice is actually the result of suggestions from all departments

There is no fixed rule by which a given material is chosen to go into the product. In the case of improve-

ment of a standard machine, the original idea of a change of material may have arisen from the fact that a complaint came from a customer in regard to failure of a part to give proper service, and this caused a general investigation. In another case, a shop foreman might complain that he could not machine the material economically. Still again, a suggestion may come from almost anyone in the plant that a certain new material being offered on the market should be used in the product to replace another material. In the case of the design of an entirely new product, the design engineer frequently encounters new conditions that he must meet. He may find that higher voltages require something better than the common insulations he has been using, or extra large castings required for the frame may make the machine too heavy. Or he may want to put in a radically different material, such as a synthetic resin part, in place of one of brass. In any of these cases, he takes his problem first to the materials and process department. In this department, there are specialists on metals, non-metals, paints and finishes, molding materials, and insulations. The specialist concerned investigates the new material available for the job. He may order enough of the material for a test, and have the shop make up a machine, incorporating this new material. This machine is then run by the testing department under conditions as near service requirements as possible. Testing of materials of this kind is not considered a laboratory function. However the research department may be called upon for aid by the materials engineer, if he finds difficulty in procuring a commercial material to fill the requirements. The laboratory may then suggest a radical departure from the customary material. When the materials and process department has found a material to meet the needs of the designer, it proceeds to write a specification that will be practical for all concerned. In this work, the laboratory aids in working up analysis specifications. The shop is called upon to go over the proposed specification and assure itself that the material to be specified can be handled economically in manufacture. It is also almost always necessary to get in touch with a number of manufacturers of materials to learn what they can furnish regularly without delays or costly set-ups. Sometimes it is necessary to go over this ground several times, and the material that is finally designated on the specification sheet is a compromise material that will satisfy the designer, the shop, and the outside suppliers. In all of the preliminary work of specification of a new material, the purchasing department and the stores have only a nominal interest. But it is vital to both of these departments to try to keep down to a minimum the number of different items that must be purchased and kept in stock. If the designers were left free, there might be a tendency for infinite multiplication of the variety of kinds and sizes of materials kept in stock, with a consequent heavy cost for clerical help and storeroom labor, space taken up, and money invested in materials on hand. The store-keeper, therefore, is not permitted to open a new account or order a new kind of material unless he gets an approved copy of the "request for approval of new material," with the signed approval of the heads of the departments concerned.



Form 4304-M
W. E. & M. Co.
Eng. Dept.

One copy to be sent to the Standards Engineer, who will have sufficient number of copies prepared for signatures and distribution.

The space above this line is for filing and must not be written on

REQUEST FOR APPROVAL OF NEW MATERIAL

(For instructions for the use of this form, see other side)

Standards Engineer—for Preliminary Investigation.

Copy to { Storekeeper _____ Works; _____ Engr. _____ Eng. Dept.; _____ Standards Eng. _____ Works; File:—Standards Eng. Dept., East Pittsburgh Works.

1. MATERIAL—List sizes required and Purchasing Department Specifications or material number, select manufacturers standard grade and stock sizes wherever possible.

2. Carried in stock by manufacturer?

3. When there is no P. D. Spec. or M # give name of manufacturer.

4. Application for material? Detail drawing # _____ Item # _____ Assembly drawing # _____ Item # _____

5. FOR APPARATUS—Standard—special—experimental—repair—S.O. No. _____ Assembly Sec. _____

6. Why cannot existing stock size be used? Give explanation, costs, etc.

7. What **STOCK SIZE** of material does the new material completely supersede?

		East Pittsburgh	Mansfield	Newark	Homewood	Sharon	South Bend	Springfield
8.	How much required at present? (Engineer to include all allowances)							
9.	To be carried as regular stock?							
10.	Estimated monthly activity?							
11.	Disposition of superseded material?							

12. STOREKEEPER—Order at once—Wait for Manufacturing Information

(Engineer to indicate the alternative desired)

Storekeeper order as

Requested by _____ Engineer. _____ Date _____ 192_

Approved by _____ Eng. Dept. Manager. _____ Date _____ 192_

Approved: Class _____ Standards Eng. _____ Date _____ (Materials Approval Committee) _____ Date _____ 192_

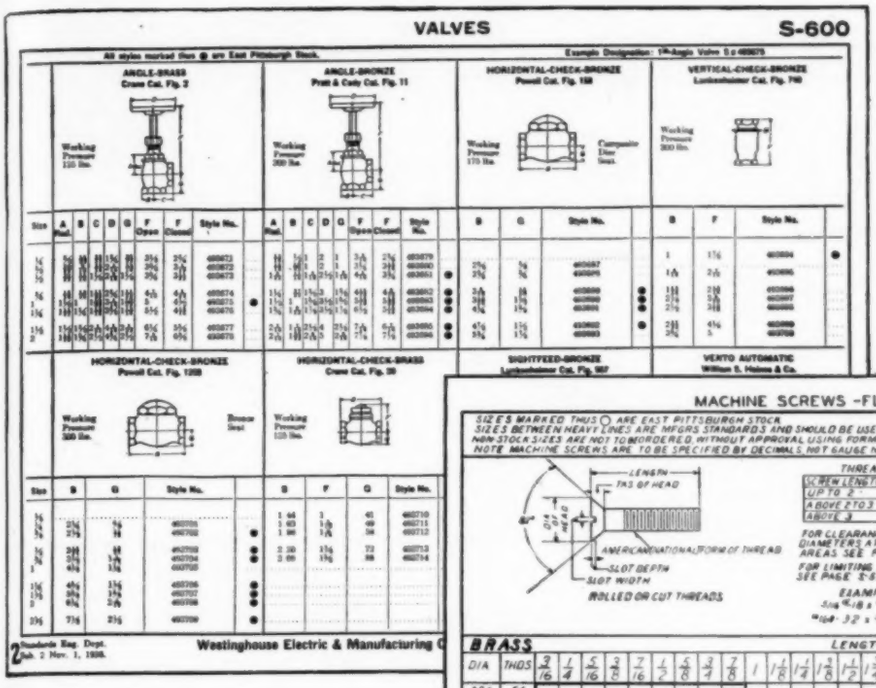
Example Designation:

(SEE OTHER SIDE FOR GENERAL INSTRUCTIONS AND CLASSIFICATIONS OF MATERIALS)

Form used for making application for the approval of the use of a new material. No new raw material, and no new stock size can be ordered by the stores department or purchasing department without the "request for approval" signed by the standards department and the approval committee

In order to keep within reasonable limits the number of sizes of different materials and the variety of supplies, such as bolts, nuts, and hardware, the standards department acts as a balance wheel. New sizes of existing material are passed only by the standards department. If a designer wants to use a length of screw or a size of material different from what the records show to be kept in stock, he must make out a request for approval and send it to the standards department. The standards department then makes an investigation to see if some change cannot be made that will make it unnecessary

All material and supplies that have been approved for stores are listed on standards sheets for the reference of the designers, who are expected to adhere to storeroom materials as much as possible. The sheet at the left shows the method of giving data on standard fittings, while the form below shows the sizes of one type of screw stocked. The sizes inclosed by the black line are the manufacturers' standards; those circled are already in the storeroom



VALVES S-600

All styles marked thus ● are East Pittsburgh Stock. Example Designation: 1¼-Angle Valve S-S 483675

ANGLE-BRASS — Crane Cat. Fig. 2 — Working Pressure 125 lbs.

ANGLE-BRONZE — Pratt & Cady Cat. Fig. 11 — Working Pressure 200 lbs.

HORIZONTAL-CHECK-BRONZE — Powell Cat. Fig. 139 — Working Pressure 175 lbs. — Composition Disc Seat.

VERTICAL-CHECK-BRONZE — Lunkenheimer Cat. Fig. 740 — Working Pressure 300 lbs.

Size	A Nom.	B	C	D	G	F Open	F Closed	Style No.		A Nom.	B	C	D	G	F Open	F Closed	Style No.		B	G	Style No.		B	F	Style No.
¼	¼	1⅝	1⅛	⅜	⅜	2⅛	2⅛	483672		¼	1⅝	1⅛	⅜	⅜	2⅛	2⅛	483679	●	¼	⅝	483687	●	1	1⅞	483694	●
	¼	1⅝	1⅛	⅜	⅜	2⅛	2⅛	483673			¼	1⅝	1⅛	⅜	⅜	2⅛	2⅛	483680			⅝	483688		1¼	2⅛	483695	
	¼	1⅝	1⅛	⅜	⅜	2⅛	2⅛	483674			¼	1⅝	1⅛	⅜	⅜	2⅛	2⅛	483681			⅝	483689					
⅜	⅜	1⅞	1⅜	½	½	2⅜	2⅜	483674	●	⅜	1⅞	1⅜	½	½	2⅜	2⅜	483682	●●	⅜	⅝	483690	●●	1¼	2⅜	483696	●
	⅜	1⅞	1⅜	½	½	3	2⅜	483675	●		⅜	1⅞	1⅜	½	½	2⅜	2⅜	483683	●●		⅝	483691	●●	1½	2⅜	483697	●
	⅜	1⅞	1⅜	½	½	3	2⅜	483676	●		⅜	1⅞	1⅜	½	½	2⅜	2⅜	483684	●●		⅝	483692	●●	2	2⅜	483698	●
½	½	2⅛	1⅝	⅝	⅝	2⅝	2⅝	483677		½	2⅛	1⅝	⅝	⅝	2⅝	2⅝	483685	●●	½	⅞	483693	●	2½	3½	483699	●
	½	2⅛	1⅝	⅝	⅝	3	2⅝	483678			½	2⅛	1⅝	⅝	⅝	2⅝	2⅝	483686	●●					3		483700	

HORIZONTAL-CHECK-BRONZE — Powell Cat. Fig. 1239 — Working Pressure 300 lbs. — Bronze Seat

HORIZONTAL-CHECK-BRASS — Crane Cat. Fig. 35 — Working Pressure 125 lbs.

SIGHTFEED-BRONZE — Lunkenheimer Cat. Fig. 957

VENTO AUTOMATIC — William S. Haines & Co.

Size	B	G	Style No.		B	F	G	Style No.
¼	1⅛	⅝	483701		1 44	1	41	483710
⅜	1⅜	⅝	483702	●	1 63	1⅛	59	483711
					1 99	1⅜	88	483712
½	1⅜	⅝	483703	●	2 10	1⅜	72	483713
	1⅜	⅝	483704	●	2 69	1⅜	88	483714
	1⅜	⅝	483705	●				
¾	1⅝	1⅛	483706	●				
	1⅝	1⅛	483707	●				
1	1⅝	1⅛	483708	●				
1¼	2⅛	1⅝	483709	●				

2 Standards Eng. Dept. Sub. 2 Nov. 1, 1926. Westinghouse Electric & Manufacturing C

MACHINE SCREWS -FLAT HEAD S-507.2

SIZES MARKED THUS ○ ARE EAST PITTSBURGH STOCK
SIZES BETWEEN HEAVY LINES ARE MFGRS. STANDARDS AND SHOULD BE USED WHENEVER NEW SIZES ARE REQUIRED ●
NON-STOCK SIZES ARE NOT TO BE ORDERED WITHOUT APPROVAL USING FORM 94504
NOTE MACHINE SCREWS ARE TO BE SPECIFIED BY DECIMALS, NOT GAUGE NUMBERS.

THREAD LENGTHS

SCREW LENGTH	THREAD LENGTH
UP TO 2"	SCREW LENGTH
ABOVE 2 TO 3	2
ABOVE 3	⅔ OF SCREW LENGTH

FOR CLEARANCE AND TAP DRILLS-MINOR DIAMETERS AT ROOT OF THREAD AND AREAS SEE PAGE S-507
FOR LIMITING DIMENSIONS OF THREADS SEE PAGE S-512

EXAMPLE DESIGNATION
Size 8-32 x 5/8" FLAT HD (M SC
Size ¼-32 x 5/8" FLAT HD (M SC

SCREW DIA	SCREW THDS	HEAD DIA	HEAD THS	SLOT WIDTH	SLOT DEPTH
086	56	164	045	030	015
112	40	216	060	034	020
138	32	268	075	039	025
164	32	320	090	043	030
190	32	372	105	048	035
1/4	20	492	139	059	046
5/16	18	632	179	070	060
3/8	16	736	209	079	070

BRASS — LENGTHS

DIA	THDS	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/2	5	5 1/2	6	DIA
086	56																													086
112	40			○	○																									112
138	32	○	○			○	○	○				○																		138
164	32		○			○		○					○																	164
190	32					○		○	○	○	○	○				○			○											190
1/4	20						○		○		○					○		○												1/4
5/16	18							○																						5/16
3/8	16																			○										3/8

IRON — LENGTHS

DIA	THDS	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/2	5	5 1/2	6	DIA
086	56																													086
112	40		○		○		○																							112
138	32		○	○	○		○	○	○	○																				138
164	32		○		○						○																			164
190	32		○	○																										190
1/4	20																													1/4
5/16	18																													5/16
3/8	16																													3/8

3 [illegible]

Specifications are written out by the materials and process department for the materials used in the product. Below is shown the first sheet of a specification for a material made in the plant. For such materials, detailed instructions for manufacture are given, but, in the case of materials purchased outside, only general requirements are stated in the specification. One of these is shown at the bottom right

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY
EAST PITTSBURGH, PA.

Process Specification No. 50593-D Sept. 11, 1926
Changed July 25, 1927

ALLOY NO. 1

GENERAL:

This specification covers the process to be followed in the manufacture of No. 1 Alloy a metal to be used where cast copper of high conductivity is required, such as larger terminals, switchboard work, dampers, etc.

In the manufacture of No. 1 Alloy only material of the highest quality is to be used. The following metals may be used in the charge.

(A) Scrap - consisting of gates, risers and mechanically defective castings of No. 1 Alloy.

(B) Wire bar ingot such as made at the Copper Mill or regular wire bar ingots (copper not below 99.90%) obtained from an approved supplier.

(C) Silicon-copper (10% Si) obtained from an approved supplier.

PROCESS:

Operations:
Melting
Molding
Pouring

Mixture

Copper -	100 lbs.
Silicon copper -	.375 lbs. (6 oz.)

Melting:- (a) General - The melting operation for producing sound castings of high conductivity of No. 1 Alloy requires very careful manipulation. An oxidizing flame or atmosphere will form cuprous oxide which is soluble in molten copper, resulting in a metal requiring excessive amounts of silicon-copper for deoxidation to prevent the metal from coming up in the mold. On the other hand a highly reducing flame will tend to charge the metal with gases which form blow holes in the casting. Best results are obtained by using a flame very nearly neutral but slightly reducing. The metal should be melted as rapidly as possible in order to shorten the time during which the metal is exposed to soluble gases. Excessive temperature must be avoided. The metal must not be held in the furnace after it has reached the pouring temperature. A charcoal covering should be kept on the metal whenever possible.

(b) Scherrts Furnace Practice- Place a shovelfull of charcoal on the bottom of the furnace. Charge scrap and ingots simultaneously, varying the quantity according to the requirements of metal on the molding floor. Charges far beyond or far below the normal capacity of the furnace should be avoided. When a large quantity of No. 1 scrap has accumulated a heat may be charged consisting entirely of scrap but the

4

P.S.# 50593 -D -1-

Westinghouse Electric & Manufacturing Company
(Including Branch Works and Subsidiary Companies)

Purchasing Department Specification No. 1689-G
(Not for publication.) Ltd.

COLD ROLLED STRIP STEEL

1. This specification covers a high grade of soft, cold rolled strip steel suitable for deep stamping, drawing, forming and bending and with a surface suitable for nickel plating.

I—MANUFACTURE

2. Process: The steel shall be made by the open hearth or any other process approved by the purchaser.

II—CHEMICAL PROPERTIES AND TESTS

3. Chemical Composition: The steel shall conform to the following requirements as to chemical composition:

Carbon	.08—.12 per cent
Manganese	.30—.60 "
Phosphorus, not over	.04 "
Sulphur, not over	.05 "

III—PHYSICAL PROPERTIES AND TESTS

4. Tension Tests: The steel shall conform to the following minimum requirements as to tensile properties:

Thickness—Inches	Elongation in 2" Percent Longitudinal	Transverse
.0625 and under	35	30
Over .0625	40	35

5. Draw Test: (a) The steel, when tested in the Erichsen Sheet Metal Testing Machine, shall conform to the following requirements for depth of draw:

Thickness Specified Inches	Depth of Draw, Millimeters Minimum	Maximum
.0281 or less	9.6	11.1
Over .0281 to .038 incl.	10.9	11.4
" .038 to .044 "	10.2	11.7
" .044 to .063 "	10.9	12.4
" .063 to .070 "	11.2	12.7
" .070 to .094 "	11.9	13.4
" .094 to .125 "	12.6	14.1

(b) The flat surfaces of the metal outside of the cup shall be free from markings indicating uneven stretching.

6. Tension Test Specimens: The lengthwise tension test specimens shall be taken with the long dimension parallel to the length of the sheet. The transverse tension test specimens shall be taken with the long dimension at right angles to the length of the sheet. The specimen shall have a uniform width of not less than ½ inch nor more than 1 inch for a gauge length of at least 2 inches.

IV—DIMENSIONS

7. Permissible Variations: Strip ordered specifically to length shall not be less than the length specified.

8. The width of strip shall not vary from that specified by more than plus .063 inch or minus 0 inch.

9. The thickness of strip shall not vary from that specified more than the following amounts:

Width of Strip—Inches	Permissible Variations in Thickness Plus or Minus—Inches
5 or less (0 to .016 in. thick)	.0015
5 or less (over .016 in. thick)	.002
Over 5 to 8 incl.	.002
" 8 to 12 "	.003
" 12	.004

V—FINISH

10. Finish: (a) The steel shall have a smooth, bright surface suitable for nickel plating, free from seams, scale marks, laminations of other injurious imperfections. It shall also be free from kinks and sharp bends.

(b) The surface shall be well oiled to prevent oxidation.

5 Cold Rolled Strip Steel P. D. Spec. No. 1689-G

S. O. | COMPONENT PART MATERIAL LIST FOR SEC._____ | Form 14327-A W. E. & M. Co. Works Dept.

ASSIGNED ITEM / DESCRIPTION AND MATERIAL	Store Room No.	Dwg., Sub., Req. No. Patt. or Style	Item	Total For Order	Section	Due	Received	Loc.	Issued	Ck. No.

COMPLETE-INCOMPLETE | Page No. | Notes

Overdue	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.

S. O. | Amt. | Type | Part | Date Due

MATERIAL REQUISITION

A materials list is written by the engineering department for every order that is put through the shops. This list enables the stores department to order material in advance, and it allows the shops to order the proper quantities and kinds of materials with the least amount of clerical work after the work has started in progress

to introduce a new size. It then recommends either rejection or approval to the materials approval committee. Each design section has a standards book, giving general data on all material kept in the store house, or regularly ordered by the company. The designer is expected to keep within the limits of these materials, if he can do so. The choice of a new material, or of a new size, therefore, must be a distinct advance in quality of the product, cost of production, or some other factor.

When the design engineer sends along to the storeroom the approval for a new material or change of size, he also submits an estimate of what he needs per month. The stores department then opens up an account, and keeps a ledger record. The withdrawals are entered every week on the main ledger, and if the ledger man finds that the stock is not moving according to estimate, he makes a report of it. Where several million dollars are permanently invested in raw materials in the store house, it is highly important to keep the materials moving on as close a basis as is economically possible. The stores department has follow-up specialists to keep the stocks moving, and also to prevent tie-ups. Every $20,000 tied up in stocks means $100 a month in interest alone, not to speak of the valuable space taken up and the possibility of obsolescence of the material by change of design. The ideal that the storeroom works for is to keep only a 30-day stock of material on hand, but the more usual average is about 45 days. In some cases, it is more economical to buy in carload lots, and, for this reason an item such as lumber may have a year's supply in the store house. Another factor is uniformity of quality, and an article such as slate is purchased in very large lots to assure the same grade and color. Materials that come from foreign countries, such as mica, are also purchased in large lots that last from six to twelve months. The purchasing department has the important function of watching the market, and the amount of materials kept in the storehouse is also governed by this factor. If there is danger of a material supply being cut off, or delivery delayed, it is up to the purchasing department to ascertain this in advance, and make its purchases accordingly. It also tries to buy ahead of a rising price market.

It can be seen, in summation, that while the design engineer is the responsible party for the results obtained from materials, he makes his final decision with the co-operation of practically every branch in the plant, and the resulting material that finally enters the machine is usually a compromise from the ideal.

Six Months in Shop Equipment Design

The eleventh Semi-Annual Shop Equipment Review number of the *American Machinist*, appearing next week, gives an accurate resumé of developments in machines, tools and materials.

The Shop Equipment News department has faithfully recorded these developments week by week—keeping you always abreast of the progress of the equipment builders.

Now the Semi-Annual Review presents under one cover a digest that gives the factory executive and equipment engineer a guide to the shop equipment made available during the past six months.

Follow the lead of some of the executives we know about—use this issue as your equipment directory.

Jigs Designed for Use with Radial Drills

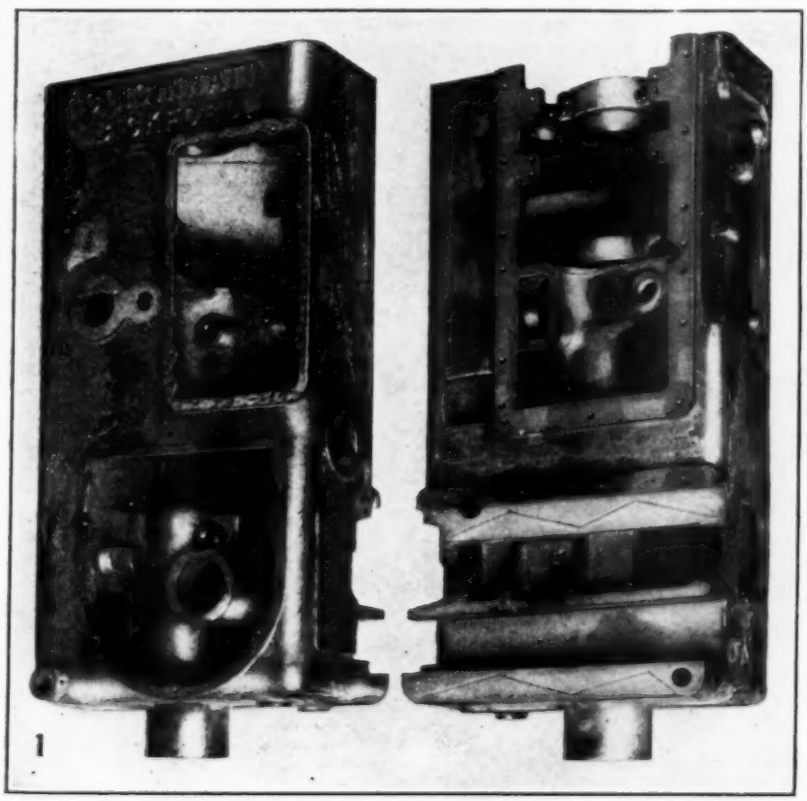
By R. N. Piper

Jigs employed in drilling, boring and reaming the heads of large radial-drilling machines—All the drilling and the most of the boring is done in a similar machine

AN EXCELLENT example of the ability of a machine tool to aid in reproducing itself, is shown herewith, where the head of the new Cincinnati-Bickford radial drilling machine is being bored and drilled on a similar machine. It should be remembered, incidentally, that it is this ability to aid in self-reproduction, that distinguishes machine tools from any other group of machines. The head casting, completely machined, is shown in Fig. 1, and presents an unusual problem to the tool and fixture designer.

After rough planing on all sides, to a size that permits accurate location in the jigs, holes for the spindle bearing caps are drilled and tapped and all other holes are drilled in the jig, Fig. 2. The bearing caps are then bolted in place and the spindle sleeve bearing is accurately bored on a horizontal boring machine, using a roughing bar, a finishing bar and a reamer. Large guide bearings support the bars and insure alignment. All subsequent machining operations are located by a plug in the spindle bore, and from the bearing that slides on the arm. The spindle sleeve bearing, 17½ in. long, is lapped to final size after all other machining operations have been completed.

The holes in the front of the head are next drilled in the jig in Fig. 3, the tools used being shown in Fig. 4. The two boring bars, *A*, have special cutters with five teeth that make it possible to use a heavy feed. The depth of the cutting teeth, and the large guide bearings, produce a smooth hole. Tool *B* has a rotary cutter in the end, actuated by an internal shaft carrying a gear that meshes in the back of the cutter teeth. This tool cuts a keyway at *A*, Fig. 3, being guided by the long key on the tool engaging the keyway in the bushing.



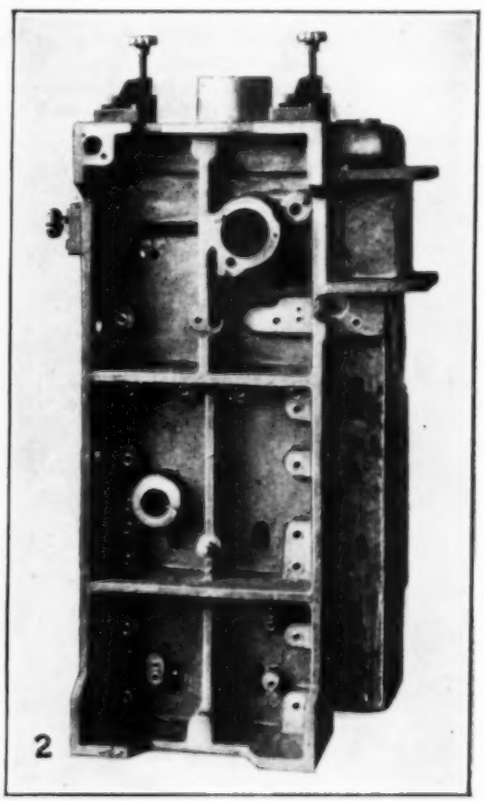


Fig. 1—Finished head casting of Super-Service radial, showing all the holes drilled and bored. For drilling and boring, the head is located from the planed slide and the spindle bearing bore. Fig. 2—Jig for drilling and boring the back of the head. The sizes of holes vary considerably and a removable bushing is used for the largest one. All of the other bushings remain in the jig, the operations not requiring them to be removed

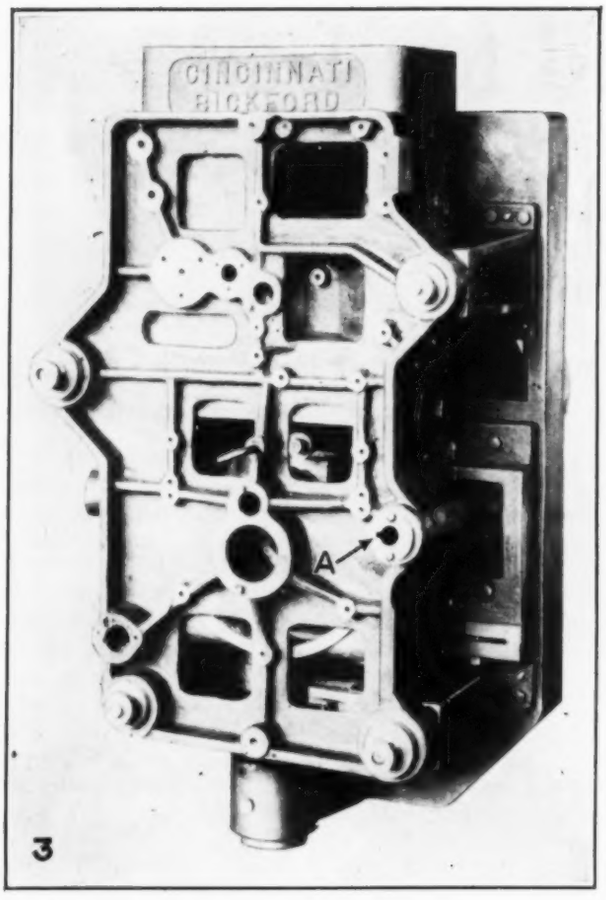
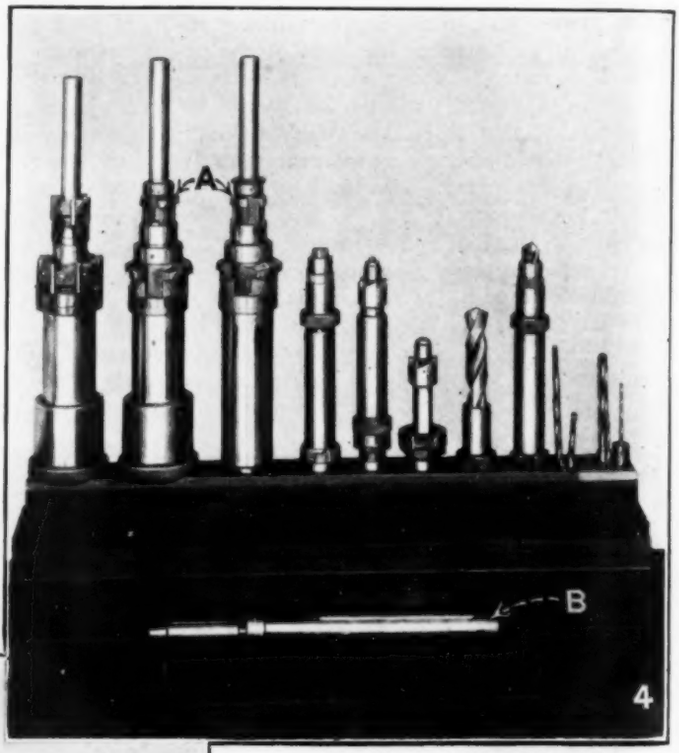


Fig. 3—The head in place in the jig ready for drilling all front holes and cutting a keyway at A. *The keyway tool is guided by the slot shown in the bushing. The bushing plate is held in place by four studs*

Fig. 4 — The tools used in conjunction with the jig shown in the preceding illustration. The two boring bars A *are provided with cutters having five teeth, each. The depth of the teeth and the large guide bearings enable the cutters to produce smooth holes. The tool at* B *has a rotary cutter in the end, actuated by an internal shaft carrying a gear that meshes in the backs of the cutter teeth. The tool is for cutting the keyway at* A, *Fig. 3, being guided by a long key on the shank which engages a keyway in the jig bushing*



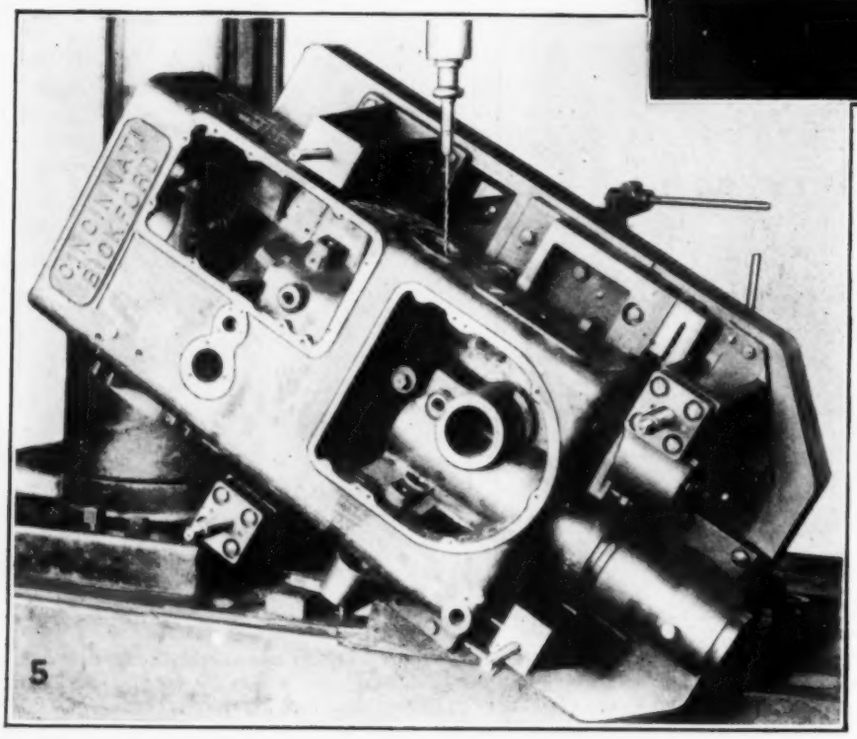
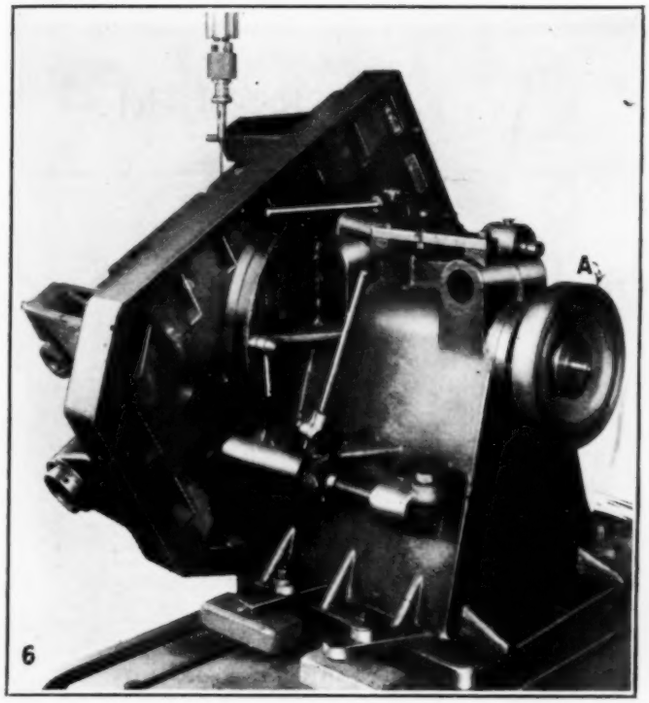


Fig. 5 — Drilling the sides of the head. Here the front bushing plate is removed and the jig is mounted on a trunnion so as to be easily handled for the various side holes



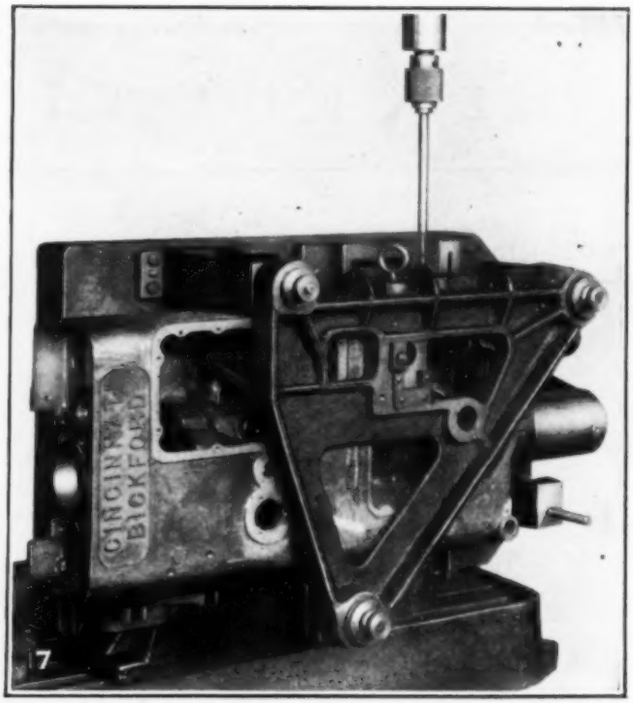


Fig. 6—Base and trunnion for mounting various jigs at will. The flanged pulley A *permits the attachment of counterweights for approximate balance. A hardened, taper index pin fitting in hardened bushings insures proper location and rigidity during drilling. Fig. 7—Another bushing plate in place on the same jig, utilizing three of the studs for holding. This permits side drilling and boring. The plate is handled by the eyebolt*

Fig. 8—Stand, or rack, for boring bars, drills and bushings. As built, it can easily be handled by a lift truck. Each tool is designated by a name plate

All the tools shown in Fig. 4 are kept together in the block, except the keyseating tool, *A*, which has its own box. The operator draws all the tools from the tool crib, with the fixture.

For the next operation the top, or bushing plate is removed, as in Fig. 5. The fixture is mounted on a trunnion, which enables the head to be swung at any desired angle for drilling oil and other holes.

The substantial construction of the trunnion and its support is shown in Fig. 6. Two index plugs are provided, the one on top for fixtures of small diameter and the lower plug where the index hole can be at a greater radius. The index holes are fitted with hardened and ground taper bushings and the hardened index plug is forced into them by a compression spring. This trunnion base is also used with other jigs, some of which are not always in balance. To remedy this condition the pulley *A* is provided and has a flange to which a suitable counterweight can be attached in the proper position to secure an approximate balance.

Another bushing plate is provided for this jig for drilling holes in one side of the head, as in Fig. 7. This plate is located on the same studs as the first plate, and, in common with other heavy bushing plates, is provided with an eyebolt so as to be handled by a crane.

All the tools are kept in suitable racks in the toolcrib and are delivered to the machine ready for the operation. Quite a complete rack of such tools is shown in Fig. 8, and is handled by the usual lift-truck. Each tool has a definite place marked by an aluminum tag fastened to the beveled edge of the rack, as shown. These racks aid in keeping track of the tools and save time both in the toolcrib and on the job.

The motor car and truck industries employed 375,281 people and paid them $657,724,859 in 1926.

Training Men for Different Jobs

YOUNG Ned Wilton is stirred up over the training of men in the shop. Quite naturally he has let sentiment run away with judgment in some cases. We all do. His father has asked Bill Holland, old friend and management specialist, to discuss the question with them.

"Ned here wants to start a sort of kindergarten in the shop, Bill; wants to train men for three or four jobs, so they won't get aggravated by the monotony of repetition," said Wilton, Sr.

"Dad doesn't realize what effect monotony has on labor turnover, Mr. Holland. And he doesn't see what labor turnover costs, both in dollars and in getting the best grade of men." Ned was much enthused over the idea.

"Tell him it's all bunk, Bill. He may believe you. He thinks I'm a back number."

"From my experience I'd say both of you are wrong to some extent. Training isn't all bunk by a long way. Shops where they really give it the attention it deserves say it pays. On the other hand, I've come to the conclusion that this monotony sob-stuff has been overdone."

"But you wouldn't like to spend eight hours a day drilling one size of hole, Mr. Holland."

"Right, Ned, *I* wouldn't. And I used to weep, too, not so many years ago, because some people have to do it. But I've seen a lot of cases where the men resented making a change. They get so they do the operation without giving it a thought —and thought is the one thing too many of them are shy on.

"One of my good friends, however, insists on training men for two or three jobs. The men usually don't like it in the beginning. But he points out to them that they are a lot more likely to have steady work if they can handle two or three different jobs. Saves laying them off if it is dull in one department."

"But why worry about that if the men haven't got sense enough to see it, Bill?"

"Because it works both ways, Wilton. It's sometimes mighty handy to have men that you can shift on other work. I remember that, in one of the flue epidemics, this same friend found his production cut very badly because illness had taken nearly every man out of one department. This made a neck in the production bottle and started him training men for various jobs."

"And you don't think that monotony cuts much ice, Mr. Holland?" asked Ned.

"Not nearly as much as I used to think. I'm speaking now of the average workman we find in the shop today. There are men who chafe under repetition work, and you want to keep an eye peeled for men of that kind. You can find better use for them than on a one-operation job. Encourage them to ask for other work—there are plenty who prefer the repetition jobs."

"Men these days seem to be afraid to tackle a new machine, Bill. I wonder why. We used to like to get a shot at something new," said Wilton, Sr.

"Difference in training, I guess, Wilton. We had to run any machine in the shop. But we were not as expert at any one of them as a good operator is today. The average operator today seems to lack a sort of 'machine-sense' that we had, when it comes to tackling a new job.

"There's another reason, too. We got paid by the hour, no matter how slow we were in learning a new machine. Most operators today are on piece work, and they lose real money when they tackle a new job. They might not be so averse to learning a new machine if the pay envelope didn't suffer."

"Then you think Ned's idea of training men isn't so bad as I thought it was?"

"Many find it pays, Wilton. Not only to train them on different jobs but to show them how to produce more, and earn more, on the single job."

"Sounds kind of weak to me," said Wilton, Sr. But Ned chuckled a bit even though his monotony idea had been sat on rather heavily.

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

EXECUTIVE FORUM

Discussion

Buying on Performance

In some establishments it is a custom, when buying equipment, to get in touch with a number of the best manufacturers, requesting them to send in their sales engineers to furnish data on the equipment which they supply, and any other information which the purchasing agent may require. This information is recorded, together with prices, and upon the completion of these records, a meeting is arranged, including the tool engineer, superintendent, purchasing agent, and any of the foremen who may be directly interested. They argue pro and con about the work in hand, discussing the advantages and disadvantages of each individual piece of equipment, finally deciding upon certain ones, which are brought into the shop for a performance test. The purchasing department arranges a system of cards on which is entered the performance of each piece of equipment weekly. After a fixed period of time when the test is completed, the cards are analyzed and the tools which stand out foremost are adopted as standard, and all future orders are placed with the concerns which manufacture them.

It has been proven, that buying on performance, where possible, is the most sensible solution. Prices should be forgotten, when it can be plainly shown that a first-class piece of equipment will pay for itself in a short period of time. There are times when a new piece of equipment will eliminate several machines, releasing considerable floor space, reducing overhead expense and direct labor in like proportion. That being the case, let us abide by this more accurate method, thus proving it with additional profits, that it pays to buy on performance alone.

—Fred Aug. Smith.

A Question of Family Income

When widespread unemployment becomes the result of increased production through the introduction of improved mechanical equipment, the adoption of this equipment is economically and morally wrong.

Some authorities take the position that the creation of new industries, manufacturing new products, will absorb the army of workers released as the consequence of employing improved equipment, but it is difficult to understand how this could work out in practice over any considerable period of time. If the workers released are not absorbed by new industries, what happens?

Production costs will have been lowered and output increased—an ideal condition for the producers—but what about the market for the product? As the wage earners of the country represent the major portion of the buying power of the country, it is clear that industry as a whole cannot prosper unless labor is fully and profitably employed.

The equipment to supply the power, and the machinery to make the products of the manufacturing industries throughout the land are all built for one single purpose, i.e., to provide the people with the things they require for necessity, comfort, and luxury. Partial unemployment means a curtailment of the wage earners' buying power, which would first affect the manufacturers and producers of so-called luxuries and non-necessities. Widespread unemployment over any long period would result in an almost complete cessation of their buying, ultimately forcing the wage earners back to the farms of the country, where at least the necessities of life could be procured.

—W. C. Peck.

In the case of Ed Smiley, who "never was much of a world beater but always worked along steadily," the company should endeavor to play fair with such an old and tried employee. The case presented of laying off skilled help due to the introduction of new and improved machines, is typical of many of the factories of today, and will be more in evidence in the future. Labor costs are reduced by the employment of cheaper help able to do the work equally well because of improved machinery. Ed Smiley's daughter can now fill his place at the machine, and the subject of family income in the Smiley family can be understood readily. The question that every conscientious executive must face is how the old and faithful employee should be taken care of. The least the company can do is to endeavor to find him another position, in the same plant or with another company. However, the responsibility of the company for the proper care and follow-up of its employees discharged because of the introduction of new machinery, is hard to define. From an economic point of view, the company would not be justified in not installing the machinery provided they were able to make a saving in production and lower the manufacturing cost. But somethin gshould be done for the man.

—Harry Kaufman.

Getting Ideas from the Men

The basic purpose of any suggestion system is to buy the useful ideas of the employees. Both buyer and seller must profit, just as they would in any other business transaction. When the company follows the sound economic principles that

govern its other purchases, the worker is given a fair share of the profit and the plan is mutually beneficial. But when the management is niggardly in its payments, insistent upon its own pet methods or unwilling to shoulder most of the operating burdens, the men naturally become disgruntled and the plan fails. Compensation is usually one of the main causes of trouble, and the size of the award should be a fixed percentage of the total saving or an amount determined by persons who have the confidence of the workers.

—H. G. KLING.

Vacations—Singly, or All at Once?

We believe with Mr. Holland and Mr. Blake that there is just one way to treat the vacation question. Close the entire shop for one or two weeks, as the case may be.

This plan has been followed in our plant for the past ten years with excellent results. A few people are kept on during the vacation to take care of orders for repairs and repair parts and for necessary maintenance work. These employees are given vacations at some other date. We try to have these vacations taken prior to the regular shut-down, so that everybody is back on the job at the close of the regular vacation period.

If we were to let one or two people go at a time we would be working short-handed from May 1 until October 30. Many of our employees would be working overtime, and the jobs covered by the vacationists would be about half done in any event. There is also to be considered the resultant confusion and errors caused by some one trying to run an extra job about which he knows little or nothing. The returning vacationist finds his work in a hectic and chaotic condition and is forced to put in some overtime to straighten things out, thereby taking the joy out of life.

—E. F. WEIMAR.

The vacation problem hit our firm so hard last season that the general manager profited by it this year. Three firemen and several toolmakers, ten or twelve hands in each department, and several of the office force all decided at intervals of two or three days apart to go on their vacations, and served notice that they would like to be off. It was impossible to give all that wanted to go the permission to do so without crippling the plant output. So we tried to arrange it satisfactorily to the hands and to our needs, but there were many disappointments, and quite a little ill feeling due to the plans they had made to go.

This year we started at the first of the summer season to make up the vacation list and hold each one to the schedule. It is no doubt the wisest plan to shut down if the trade conditions permit, and one has a stock to ship from. All business cannot do this, and in our factory, the Hoyt Electrical Instrument Works, we cater to special orders of customers, requiring many skilled instrument builders, so we must have enough at work at all times to protect production. This plan of issuing the vacations in place of each going when they wish is working out satisfactorily among 175 hands.

—CHARLES H. WILLEY.

From a manufacturing point of view, it is much better to close down an entire plant for a two-weeks vacation period than it is to operate shorthanded for three months out of the year. In the first place, there is an opportunity to do all machine overhauling during the shutdown, and thus decrease the time lost in breakdowns during the rest of the year. Another advantage is that provisions for changes in routing, such as putting in new conveyors, moving machines, etc., can be cared for. A third reason for favoring the two-weeks shutdown is the lowered efficiency of a plant when operating shorthanded due to the inadequate supervision when straw bosses, foremen, or superintendents are on their vacations.

The personnel of the organization is chosen to work together with the greatest efficiency when all members are present. It is impossible to maintain this efficiency when some of the men are attempting to do a part of someone else's work with which they are not entirely familiar.

—W. L. ROMICK.

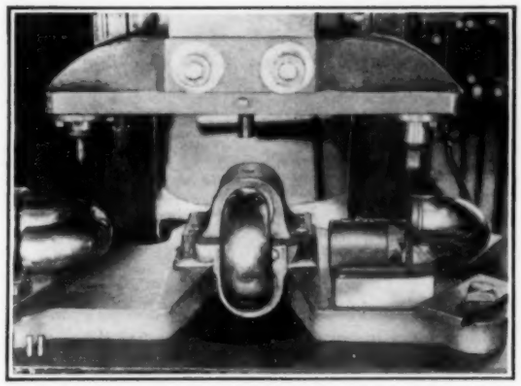
Interesting Men in the Shop

A constant personal contact fosters mutual confidence. Where the contact is lost, there will also result a lack of interest in the company. To accomplish the promotion of team work, the worker's confidence must first be won, and in order to get this confidence, there must be provided proper relations between the worker and the management. The shop paper is one medium for bringing the men and the management together.

Personal contact between the management and the worker in the form of honest praise and recognition for good work, and the rewarding of such work through the pay envelope, is the best means of winning the worker's interest. When the worker feels and knows that the management will support him and recognize good work, his ambition and energy will be stimulated and increased.

There can be no question but that, where a man is capable of efficient work, his value can be increased, together with his interest in the work, by paying him a wage in proportion to his own efficiency. It is understood that a worker engaged on work for which he is particularly adapted can accomplish considerably more than a worker of average ability working under ordinary conditions. As a means of arousing and maintaining interest among men in the shop, wages hold the place of first importance. The use of an adequate wage system which recognizes and rewards good work, together with encouragement from the company and personal contact with the management, will go a long way in promoting interest among the men.

—G. H. GUNN.



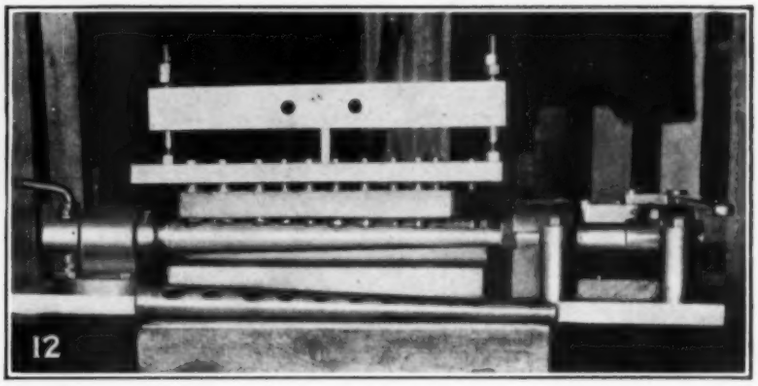


Fig. 11—Piercing the bow. Fig. 12—Piercing straight-line holes in the body

Interchangeable Manufacture of Saxophones

AFTER bodies, bows and bells of a saxophone have been formed and drawn, they are ready for piercing and other final operations. Three holes are pierced in the bows, as shown in Fig. 11, for which operation a three-stage die is used. The left-hand portion pierces a hole in the curved section, then the work is shifted to the center and right-hand sections, respectively, where the holes nearer the open ends are pierced. The holes are elliptical in shape and the metal around them is later spun from the inside to form flanges.

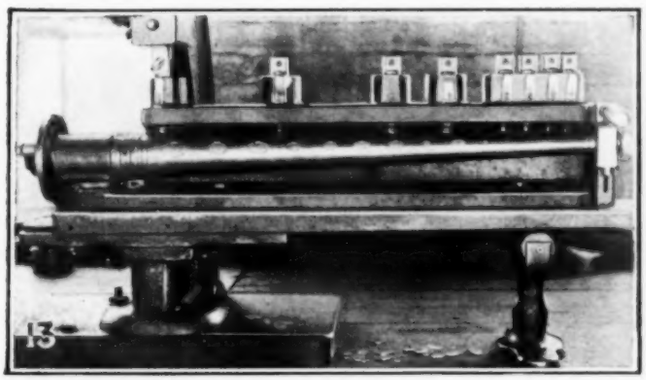
In the same machine, the straight-line tone holes of the body are pierced simultaneously in the die illustrated in Fig. 12. The left-hand section of the base, containing the mandrel, is pivoted so that it can be swung around a distance sufficient to permit loading and unloading. When the loaded mandrel is returned to the operating position, a slip bearing supports its projecting end, in which position it is shown.

Other body holes are pierced by the hand-operated press illustrated in Fig. 13. In this tool, the mandrel, attached to a sub-base, likewise is pivoted, although it is locked at the smaller end by the quick-acting clamp shown at the right. Inasmuch as the holes are punched in different radial positions, the mandrel is made so that it can be indexed and locked as desired. One hole only is pierced at a time, after which the entire base is moved horizontally, so that the next hole will lie under the ram.

As in the case of the bows, the holes are elliptical in shape, so that when the surrounding metal is spun upward, all the flanges will be approximately of the same height. The spinning is done in a drill press, as illustrated in Fig. 14. The work-holding device resembles the tools previously described, in that the mandrel swivels, being supported at the projecting end by a slip bearing, while the entire fixture slides horizontally to bring the holes successively in line with the machine spindle.

Before placing the work on the mandrel, spinning balls are placed in cavities, or pockets, located in the mandrel body. The cavities are deep enough to permit the saxophone body to pass over the balls. The upper

Conclusion of the article.



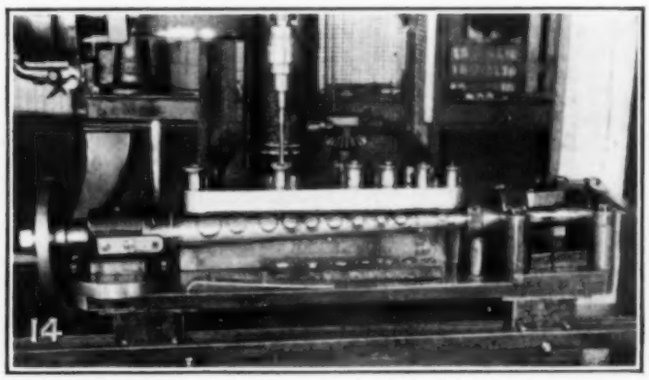


Fig. 13—Irregularly-spaced body holes are pierced in a hand-press. The work is placed on a mandrel of the swivel type and is located from one of the straight-line holes. An indexing plate is attached to the mandrel, while the opposite end is supported by a quick-acting clamp. Fig. 14—The metal around the body holes is spun from the inside to form a flange. One end of the mandrel is attached to a swivel plate and the other end is supported by a slip bushing. One hole is formed at a time by pulling a spinning ball upward

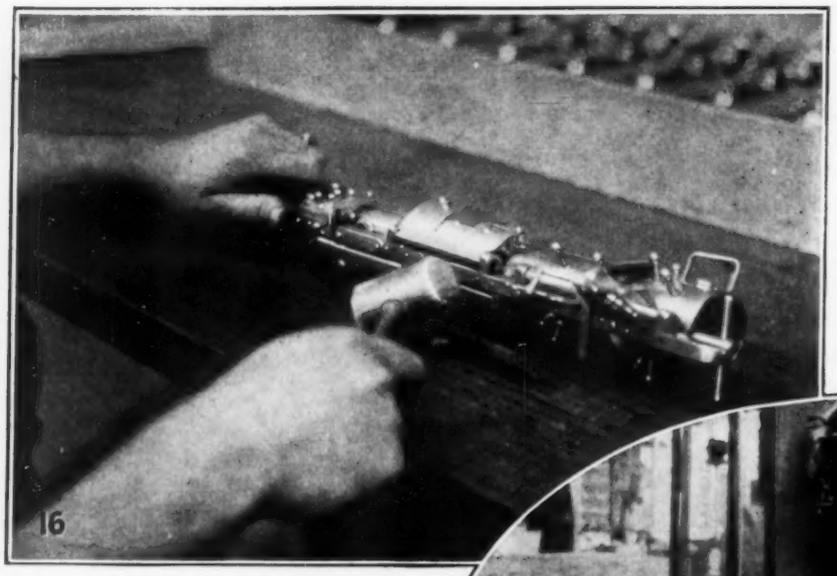


Fig. 16—Knobs, thumb rests, music-rack holders and other units, are soldered to the body and then the assembly is inspected in a leaf type gage, as shown. On account of slight variations due to expansion and contraction, it is necessary to tap the assembled pieces slightly with a hammer until the gage indicates the correct spacings. Individual gages and straightening fixtures are required for each type of saxophone body

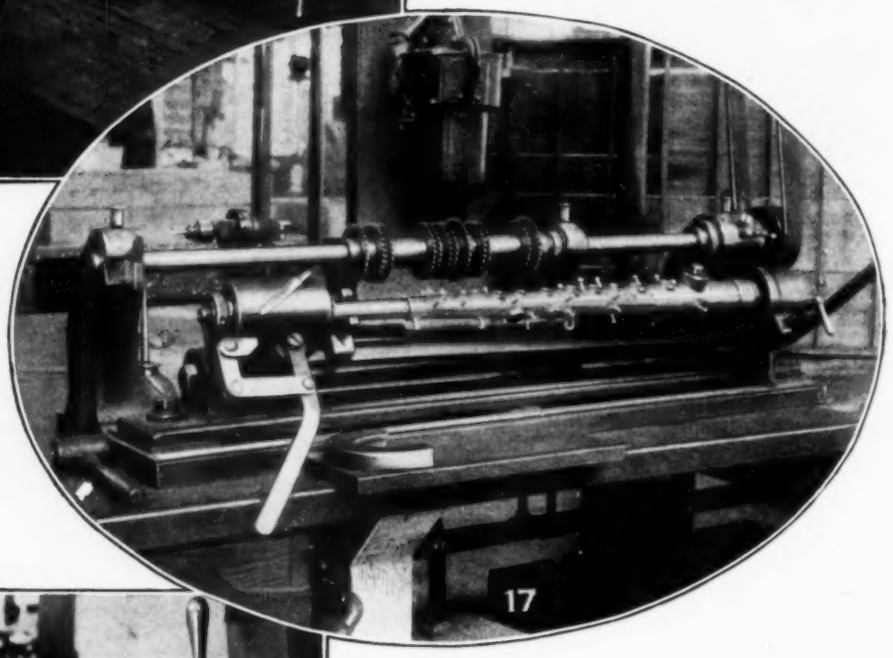


Fig. 17 — Knobs are milled for the key fits in a bench machine. The work is fitted over a mandrel supported by both ends in a swinging frame. When the frame is raised, the knobs pass the path of the cutters and are milled to proper width and space locations. Different spindles equipped with gang cutters may be interchanged with the one shown

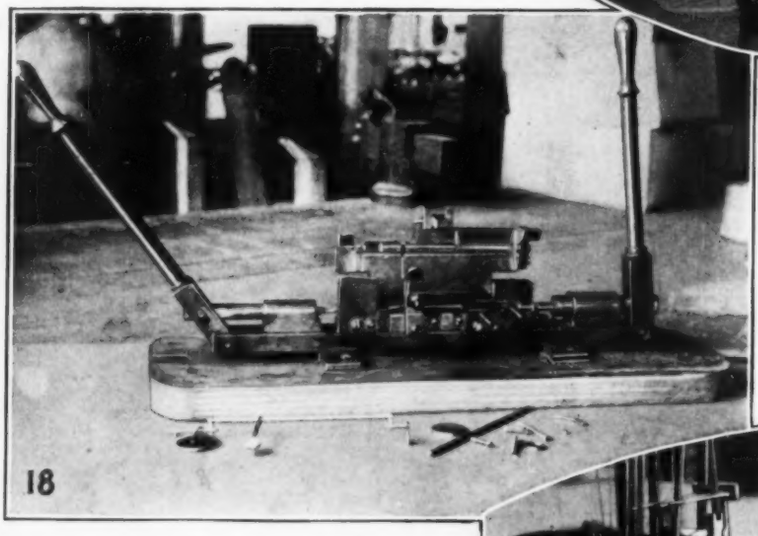


Fig. 18—Key assembly is handled in fixtures arranged to locate and hold the various pieces making up the key, until they are pressed together. The ends of the shafts are knurled, so that when the corresponding piece has been pressed over them, a tight fit will be made. The assembling is done by operating the levers shown at the ends of the fixture. A group of parts and an assembled key may be seen in front of the fixture

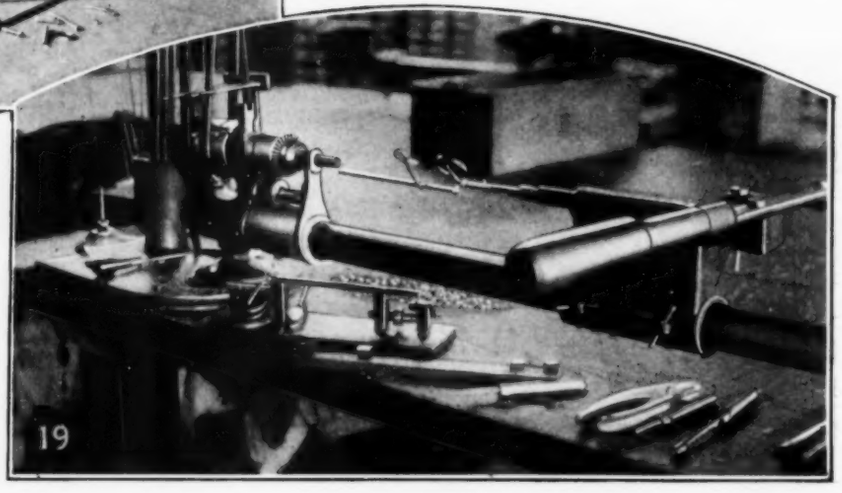


Fig. 19 — After a key has been assembled and soldered, the final operation, termed cutting-in, is performed in a bench lathe. The ends of the key are spot faced to size as shown. Inspection gages are required for each size of key, the gages for the key in the machine being shown at the front of the lathe

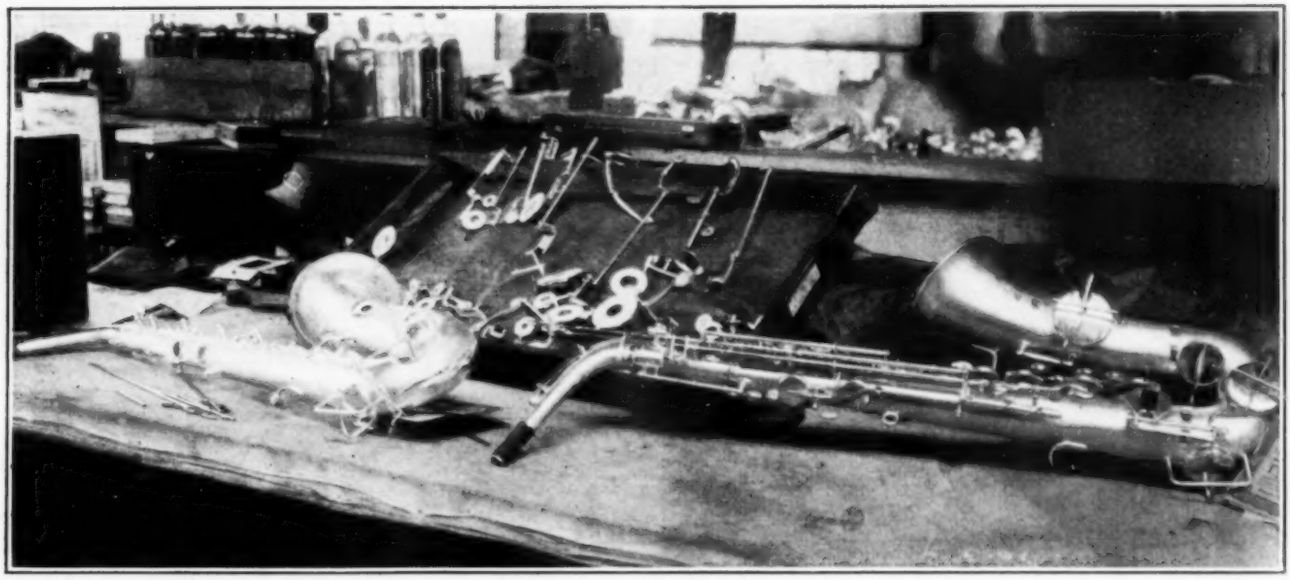


Fig. 20 — Assembly of a saxophone is handled by a single operator who does all the fitting required. A set of keys for a particular model of saxophone is placed in a box, so that it is necessary only for the operator to get a box of keys and a saxophone body from stock, in order to complete an instrument. At the left is shown a body assembly, at the right is a completed unit, and just behind the two is a set of keys in one of the stock boxes

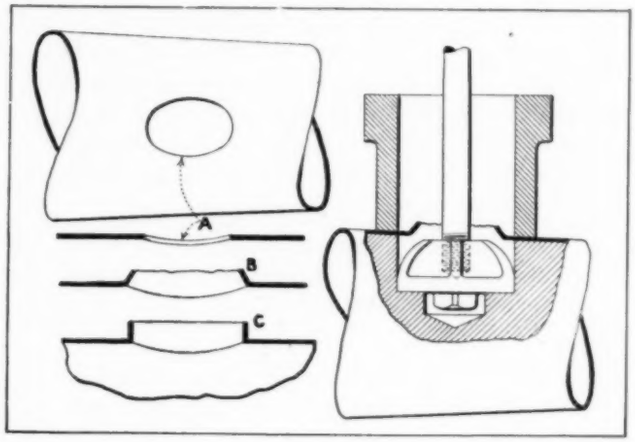


Fig. 15—An outline of how the metal around the holes is flanged. After the work has been placed over the mandrel the spinning ball is pulled upward, forming the flange inside the bushing

ends of the spinning balls are tapped, so that when the threaded driving-stud in the machine chuck is lowered, it screws into the balls and drives them. Upon upward movement of the spindle, the ball spins the metal surrounding the hole to form a flange. Bushings are used for each hole, so that their locations and sizes can be held within extremely close limits, as these spacings are important to the tone qualities of the instrument.

Details of the operation are illustrated in Fig. 15, the work as blanked, being shown at *A*. Prior to being spun, however, the material surrounding the holes is annealed by a gas flame, after which the metal is bent upward slightly about the hole as shown at *B*. This operation is done by hand. At the right is shown the relative position of the bushing and the spinning ball, while at *C* is illustrated the finished flange. Following this operation, the bodies are placed in a fixture of similar construction for facing the flanges. A spindle stop determines the machined height of the faces, which in turn are checked by a gage located on the fixture frame.

After this operation, the bodies go to the assembly department where knobs, T-guides, thumb rests, stops, and a music-rack holder are assembled. These parts are correctly located on the body by fixtures that hold the parts in place until they are soldered. Slight variations in location exist, however, due to contraction and expansion, so that it is necessary to gage and straighten the fittings before proceeding. This work is done by hand in connection with leaf gages as illustrated in Fig. 16. If a knob or guide is "off," it is aligned by tapping.

Following the straightening, the knobs are gang milled in the bench machine shown in Fig. 17. The body, placed on a mandrel, is located by a plug positioned in the largest tone hole. The mandrel is mounted in a swinging frame pivoted to the machine base, so that when the frame is raised upward by the lever shown at the left, the work enters the path of the cutters, thus milling the correct spacing for the key fit. After similar operations have been performed on the bell and the bow, the three pieces are joined to form the body assembly.

Keys are assembled in fixtures such as the one illustrated in Fig. 18, so that they are interchangeable with one another. In front of the fixture, at the center, are shown the parts before assembly, and at the left may be seen an assembled key. Press fits are made with knurled surfaces, so that the parts hold fast until they are soldered. Approximately 150 fixtures of this type are available for the different styles of keys. The final machining performed on the key is called the cuttings-in operation, in which the keys are spot faced to length. This operation is handled in a bench lathe as illustrated in Fig. 19. A location and a snap gage such as may be seen on the bench are provided for each style of key.

After inspection, the necessary keys for a particular model of saxophone are arranged in sets and placed in stock boxes, so that at assembly it is necessary only to have one of these boxes and a saxophone body to assemble an instrument. The procedure followed is to have a single operator handle the complete assembly. An unassembled saxophone body is shown in Fig. 20, at the left, and a finished saxophone at the right.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Keeping a Machine Busy

"GLAD I don't work in the Glennon shop, Al. They won't discard an old machine when a new one beats it." Ed had just been visiting a fellow foreman in another shop and was "all pepped up" over it.

"Tell me about it, Ed. Was the old machine a piece of junk?"

"Well, no, not junk, Al. But the new radial had it stopped. I saw the new machine drill three cylinder heads with twenty-four 1¼-in. holes in a 1¼-in. head, and drill and tap a ¾-in. hole one inch deep, in 22¾ min. A test on the old machine took nine minutes more for another three heads. Three minutes a head is sure worth saving, Al. But the super wasn't sure whether he'd dump the old machine or not. Williams wouldn't hesitate a minute."

"I'm not so sure, Ed. He might buy the new machine, but he might keep the old one also if it could do as well as you say. Only three minutes more on each cylinder head is doing pretty well for an old machine that probably doesn't count very much on the books. How many cylinder heads do they handle a day?"

"Don't know, Al. But I'm surprised at you, standing up for the old machine. You generally boost for new ones all the time."

"You've got me wrong, Ed. I'm all for the new machine when it can save enough to pay for itself. If they can keep the new machine busy and save three minutes on each piece, it will pay to buy it. If they can keep it running only half the time or less, it will take some figuring to know which machine will earn the most dividends for them."

"But the new machine wasn't up to its limit even then, Al. The drill wouldn't stand any more speed or feed, but it was supposed to be the best they could get."

"That doesn't help the machine any, Ed. If the drill was the best to be had, then the machine can't do any better. So it remains a case of making some calculations as to whether it will pay to chuck the old machine or not. Unless they can keep a machine busy more than I think, they can't afford to throw the old one into the discard, especially if they have the new one you speak of to put on the heavy drilling jobs."

"Perhaps you're right, Al. But I don't know whether I could figure it out or not."

Would it pay to throw out the old machine as Ed wanted to do? Or was Al right in saying it depended on the amount of work to be done? How would you figure it out?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Vacations as a Bonus

NO MATTER what the size of shop, type of work, or kind of labor, there are bound to be certain phases of production which may be helped by vacations as a bonus. Some of the many points about which competition may be centered are attendance, punctuality, ability to meet schedules, continuous operation of machines without breakdown, neatness of equipment, and personal appearance.

Consolation prizes of a day off may well be given those who made an obvious improvement in any of the competitive fields, but were not among the winners. Once a given habit has been established by the competition the fields of competition may be changed to others for which it is desired to raise the standard, without any grave possibility that the high standard established in the initial fields will be appreciably lowered. —G. THRONE.

A VACATION given for special service without interfering with the regular work is an ideal incentive. Such a bonus is unsurpassed in the effect it has on the morale and interest of the workers. There is no better way to encourage the worker's interest in his work and in the welfare of the company.

Many enterprises are adopting various types of vacation plans, not merely as a reward for faithful service or as a health measure, but also as a good business policy. Not a few are discovering that vacations can be worked out successfully during the shut-down or inventory periods. —R. D. GUNNIS.

Promoting Interest Among the Boys

ALL shops should try to run a mechanics' course to which all boys should be encouraged to attend. The firm could spare a small room for the meetings. A few textbooks, and those weekly periodicals for which the firm subscribes and which are thrown away when a week old, could be used. All should be encouraged to submit papers and enter competitions. The expense the management would incur in awarding a few prizes would be amply repaid by a more contented shop force, besides giving an incentive for the course.

Any unsolicited testimonials which the firm receives should be shown to the shop force. Although the management may flourish these testimonials before prospective customers, they never show them to the mechanics who turn out the work. Also let the firm's history be known—most firms have had interesting periods in their life. —W. E. WARNER, *England.*

THE · NEXT · TOPIC

Standards for Machine Finishes

ADVANCE QUESTION

Al suggests the use of standards for machine finishes, but Ed thinks it should be left to the judgment of the good mechanics. Who is right?

Getting the Wear Out of Machines

THE majority of machines are not run even up to the safety margin as recommended by the machine tool builder. The rapid changes in design and increased efficiency of materials now used in our machines enables us to boost feed and speeds, but we do not take full advantage of them.

To prove that our machines are being nursed along, put an up-to-date machine in line with your old one. You will then begin to push your speeds and feeds up on the old machine only to find you cannot catch up with your new young blood. Unless you buy a new machine you will never realize the inefficiency of your old, obsolete ones. —C. L. HENRY, *England.*

Something Besides the Pay Envelope

ALL other things being equal, the average workman will go where he gets the most money. Things are not equal everywhere, however, and the difference in working conditions often is a deciding factor in keeping a man on the job, even though he may not consider them when applying for work.

Williams' idea of a shop paper is a good one if it is an extension of the regular policy of the management showing an active interest in the employees. The paper should go further than telling about the plant or the product. It should take the employees into the confidence of the management and make them feel that management and men are working together for their mutual benefit. —C. H. LATTNER.

He Never Asks for a Raise

AS ONE who, during a long lifetime, many times tried both waiting for a raise and asking for one, I would say that the action of Bill Hankins was absolutely right. A shop that does not seek out men systematically who are worth more pay, is no place for a first class workman.

Being turned down is a humiliation that no good workman should be made to endure. The only way to avoid it

is to leave after giving ample opportunity to the firm for noticing his worth. Bill may thereby help his former shopmates also, for the firm may wake up to the advantage of just treatment after it has lost some of its men. If he had stayed he would have injured his shopmates by showing the firm that it could under-pay its men, and expect to be given a warning before it was too late.

—T. E. WELSH.

Making the New Planers Pay

IN A similar case in my own experience, an operator was rather careless in the use of an old planer. I spoke to him several times and he always replied by saying that the machine was only junk, anyway. Later, we decided to buy a new planer. I took a catalog to this man, showed him a picture of the new machine, and told him what it was going to cost the company. When the new machine was finally installed we found a different attitude on the part of this workman. He was more careful in the use of the machine, more accurate and painstaking, and a credit to the shop.

—ROBERT MAWSON.

Helping the Firm Make Sales

ROBERTS was not entitled to the full 10 per cent received by the regular salesman. He was a salaried employee of the company with a regular income. When he did some sales work on the side he put himself in the position of a salesman on a salary plus commission basis. It would not be reasonable to pay a man $10,000 at one stroke because he was lucky enough to land a $100,000 order.

If there were no objections because of any understanding between the firm and its regular salesman, and if he were quite capable of handling the business himself, then it was quite right for Roberts to make the sale. I believe it is good practice for him to divide the commission with a regular salesman whom he may have called.

—HENRY J. KENNEDY.

Monthly Checks on Workmen's Ability

IT IS a good practice to make a record of better jobs that workers are likely to be capable of filling, and to guide them into these jobs. Monthly checks on workmen's ability help the foreman to ascertain which of the workmen are headed for promotion. They will also enable the foreman to ascertain whether or not his men are advancing as rapidly as their capabilities indicate that they should. They are likely, moreover, to throw light upon undesirable conditions in the plant.

—GEORGE H. GUNN.

Should He Report Another's Error?

THE fault was not so much with the man who discarded the motor as with the management. Obviously, the man was ignorant and frightened. Very likely a heartless, strict "efficiency" system tempted him to hide his error rather than admit ignorance.

Mistakes, misunderstandings, and even occasional blunders must be expected from all human beings. The most colossal blunder is to ignore this fact and expect perfection in subordinates. Detailed rules attempt to dictate every move of each employee. Under this stupid system a man's chief interest is that of self preservation.

—A. W. WILLIAMS.

THE finding of an expensive tool, belonging to another department, in the scrap heap should be ample indication to the foreman that something is wrong with the toolroom and its method of issuing and disposal of the tools. The foreman who has the interest of the company foremost in mind should report the matter to the other department, instead of using the tool in his own department and saying nothing about it.

Co-operation with other departments can be measured in dollars and cents. The foreman who can see beyond his job will try to remedy the error by reporting it to the proper source in order to prevent its future occurrence.

—JOSEPH BELL.

IF THE foreman who found the tool merely keeps it he is not showing a very co-operative spirit. On the other hand, to report it conveys a sort of superior attitude. He should return it personally, with a friendly comment or two, indicative of the attitude that in similar circumstances he would appreciate having shown towards him. Then the foreman of the department from which it was discarded can take the necessary corrective measures. The condition needs correction, not punishment.

—ALBERT HOERSCH.

How Much to Spend for Repairs?

DETERMINING the relative advantages of repairs vs. new machines is not normally a part of the foreman's job. The foreman plays his part when he brings the need of making repairs to the attention of the management. He may, of course, also give his estimate of the cost of repairs, or recommend a better or later type of machine if he happens to know of such. He then gives the management immediate possession of a basis on which to proceed. It is up to the management to balance the cost of repairs against the cost of a new machine.

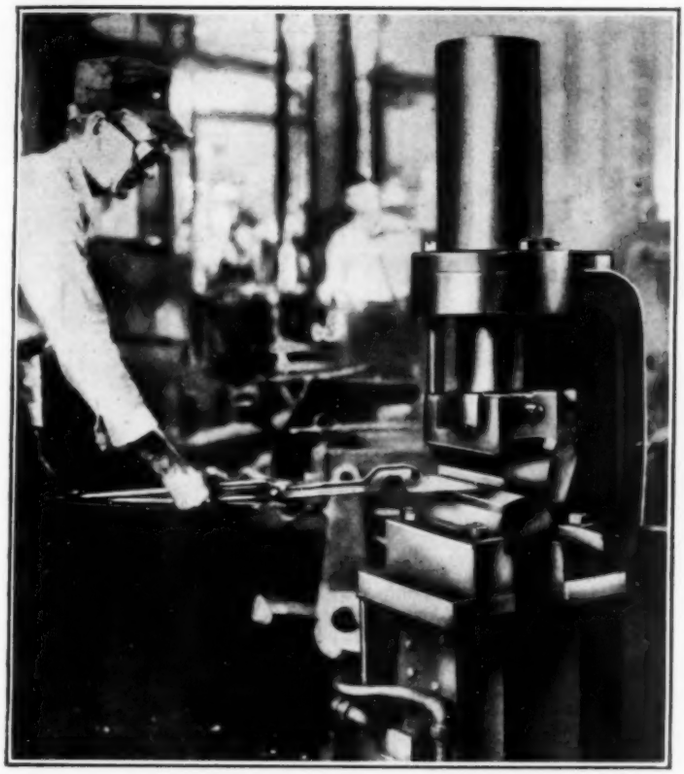
—JOHN KOLLARIK, *Manufacturing Analyst.*

A PLAN which worked out well in one shop is as follows: Any foreman could write an order to repair immediately a machine up to the amount of $20, labor and material cost. The departmental superintendent could sign an order for machine repairs up to amounts of $100. Any repairs to cost more than $100 had to have an appropriation, the same as for a new machine.

—W. C. BOSTON.

Putting Color on the Machinery

GIVE the average machinist a good machine with a bright color, and he will not only be proud of it, but will keep it looking well, and will probably get out more and better work. And, from the selling point of view? Well, that needs no boosting. Look at any piece of machinery with a good color scheme. Then another just like it, but with a dull finish, and see which will sell the faster. Yes, Al is right. —WILLIAM J. FISHER, JR.



Forging Tools Built in a Railroad Shop

By Frank W. Curtis
Western Editor, American Machinist

Fig. 1—A home-made, air-operated forging hammer. The upper die is mounted on the crosshead and the lower one on the lower member of the yoke that connects the pneumatic cylinder to the channel-iron base.

BLACKSMITH-SHOP operations at the Louisville, Ky., shops of the Louisville & Nashville Railroad Company, which include the making of the usual run of railway repair parts, are carried out in a modern building equipped with adequate machinery capable of producing the necessary output economically. Several home-made tools are included among the operating equipment. An outstanding device of this type is the air-operated forging hammer illustrated in Fig. 1, which is used for a variety of purposes, having been originally developed at one of the Big Four shops. Constructional details of the device are shown in Fig. 2. It consists chiefly of a cast-iron cylinder and a steel piston carried in a wrought-iron yoke attached to a base made of channel iron. Both dies are held in place by tongues and keys, the upper die being connected to a crosshead mounted on the lower end of the piston by means of a tapered shank and a pin. The base is made of two 13-in. channel-iron sections supported by crossplates. Operation of the hammer is controlled by a foot-operated valve. A sectional view of the cylinder and the piston is shown at *A*. When in operation, air passes through the ¾-in. pipe shown at the right and enters the chamber *B*, causing the piston to travel upward until it has reached a height bringing one or both crossholes *C* into the chamber. At this point air travels through the central hole *D*, causing the piston to descend rapidly. The volume of air applied controls the impulse of the return stroke, enabling either a light or a heavy blow to be produced. The spacing of the crossholes in relation to the upper section of the piston and to the bottom portion of the cylinder is important and must be laid out in proportion to the stroke of the piston. The stroke of the unit shown is 5¼ in. A ¼-in. air line controlled by the operating valve furnishes air for blowing the scale from the work and dies.

A similar hammer is utilized in welding chain links, being mounted on a base that also accommodates an 8-in. air cylinder used for bending, as illustrated in Fig. 3.

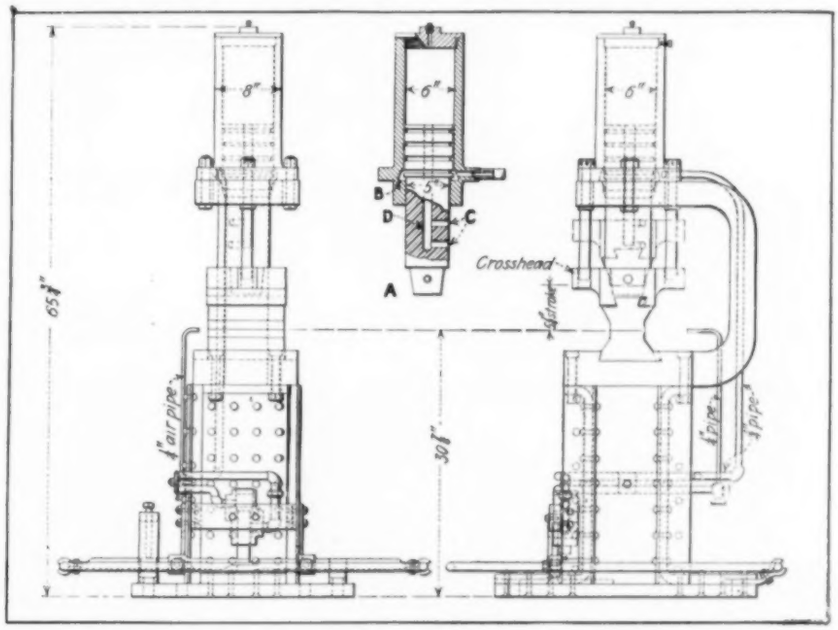


Fig. 2—Constructional details of the forging hammer showing a sectional view of the cylinder and the piston. Air enters through a ¾-in. pipe into a chamber and forces the piston upward. When the piston reaches a height where the crossholes enter the piston is forced downward

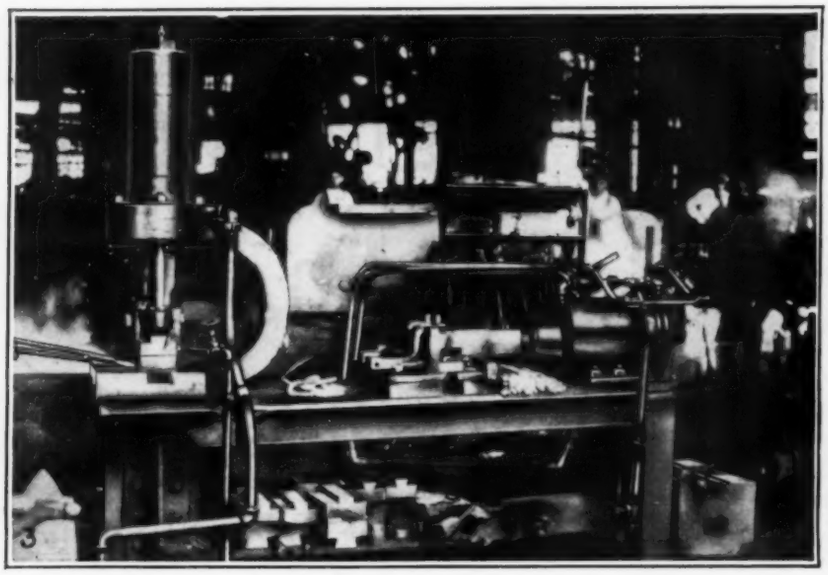


Fig. 3 — An air-operated hammer of similar design is used for welding chain links. It is mounted on a base having attached to it, at the opposite end, an air-operated bending unit. Links are formed to a U-shape by the bender, heated and closed by hand on an anvil, and the welding is done in the hammer.

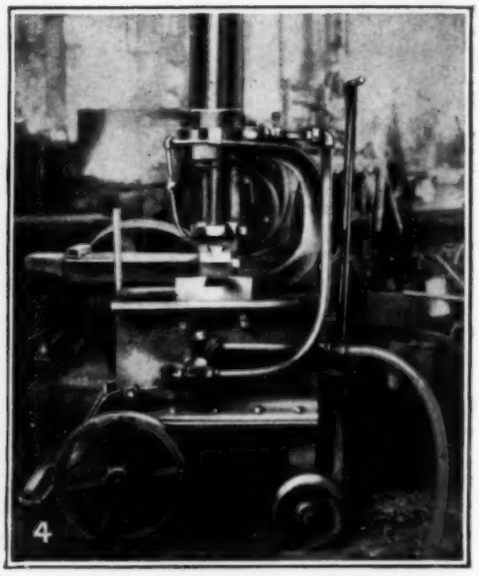


Fig. 4—A portable air-operated unit using the same type of hammer, although the base is of different construction. The operating valve is foot controlled. A small pipe line delivers air to blow the scale from the work and the dies. Both dies are held in place by tongues and keys, dovetail in shape, enabling them to be changed rapidly

Links are formed to a U-shape by the bending unit, then heated and joined by hand on an anvil, after which the welding is done in the air hammer. Different sizes of bending and welding dies are available for various styles of links. A portable air hammer mounted somewhat differently than those shown, but embodying the same constructional features, is shown in Fig. 4. It is used for miscellaneous small work.

A double-cylinder bending machine for forming bands, yokes and other similar parts is shown in Fig. 5. It has two 22-in. cylinders hooked up in tandem. Air under pressure is admitted to both cylinders; thus the total of the mean effective pressure on the pistons is the same as if a single cylinder having twice the area were used. Since no larger cylinders were available, the hook-up shown was resorted to. The extra pressure provided by this means is necessary for bending heavy pieces.

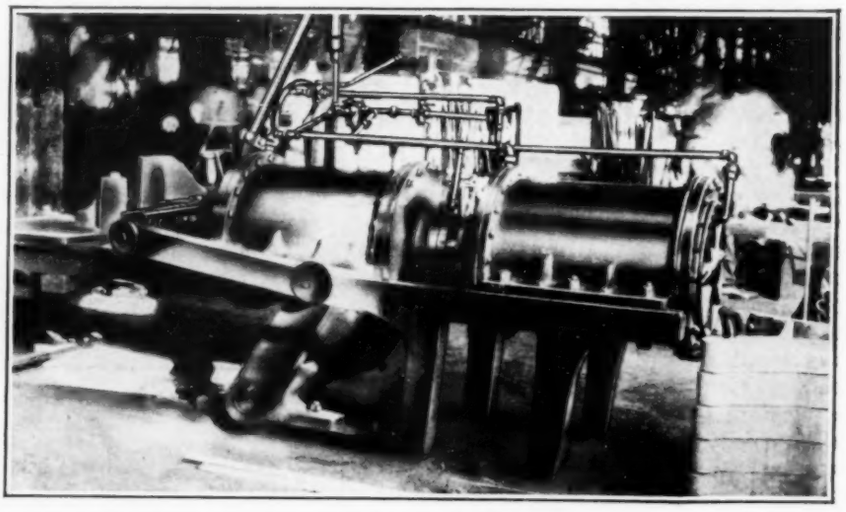


Fig. 5—Bands, yokes and other similar parts made of flat material are formed to shape in the air-operated bending unit illustrated. To insure sufficient pressure at the ram to bend heavy parts, the two cylinders are connected in series. The set-up can be quickly changed

Standards for Machine Tool Indexing

By J. Homewood

With the idea that an angle should be placed on a drawing in such a manner that the workman would not have to subtract from 90 deg. in order to determine the amount to set over the head, an investigation was made in the shop to determine just how the graduations were arranged on the shapers and planers. The job at hand was of such a nature that either a shaper or a planer could be used.

It was found that the shaper head read 90 deg. when in the vertical position, while the planer head read the same when in the horizontal position. With this condition in the shop, no standard arrangement could be made for dimensioning the drawings in the engineering department. It would seem that there is no good reason why these two machine tools should not be graduated the same, so that angles could be simplified for the draftsman and the machinist.

There does not seem to be a general appreciation of the fact that high-speed steel will do many times the work of carbon steel in tapping cast iron. High-speed steel resists the lapping effect of cast iron much better than does carbon steel. This is even more evident with small, fine thread taps than it is with large ones, and with any good grade of cast iron, the tapping speeds can be raised very considerably by using high-speed steel taps.

Color Enters the Machine Shop

By George S. Brady
Associate Editor, American Machinist

Machinery of all kinds must apparently meet the demand for more color—Some color schemes in use, and nature of the finishes

A MANUFACTURER of hardware and tools in the East, who had been using black finishes for forty years, found that his sales were dropping off. He went out into the trade and made a sales investigation, coming back with the cause and the cure. He found that the buying public no longer wanted an array of black objects. Black has always been a favorite color for mechanical parts. It is pleasing and inconspicuous. It makes awkward shapes less visible, and makes large and clumsy objects appear small. Moreover, the black pigments make the most durable baked finishes known. But he found that all of these arguments are apparently not satisfying to many buyers at the present time. The times and styles have approved color, and the monotony of all black tools and all black hardware, and other black mechanical objects, is apparently no longer desired, even in the shop.

It is generally recognized that color now predominates in the automobile trade. The increase in the demand for color in machines and tools has been coincident with the spread of color in automobiles, but there is no reason to believe that it has been a direct result of it. In the case of typewriters, one of the leading manufacturers experimented with color finishes as demanded by the trade, and found that the required colors were less durable and were costing about 15 per cent more than black finishes. But in spite of this, this company found it advisable to meet the tendencies of the trade with a full line of machines in bright colors. In the machine shop bright colors on the machines are likewise not as durable as black, but they promote cleanliness as well as add to the cheerfulness of the working surroundings. The cost of repainting the machines at more frequent intervals than when using black is also claimed to be small as compared with the benefits derived.

White is not a new color in machine work, and has been used on bakery and laundry machinery where it is desired to have a sanitary and easily cleaned surface. For such purposes, glossy white finishes are the most popular, but semi-gloss and flat white have been coming into use on a still wider range of machines. White enamel and other white finishes have a pleasing appearance, especially on light production machinery in open rooms, but they are hard to keep clean. Some finishes of this kind have been developed that will not be affected by the action of lubricating oils or gasoline, but in general they will not stand up under temperatures as high as the boiling point of water sometimes used in cleaning.

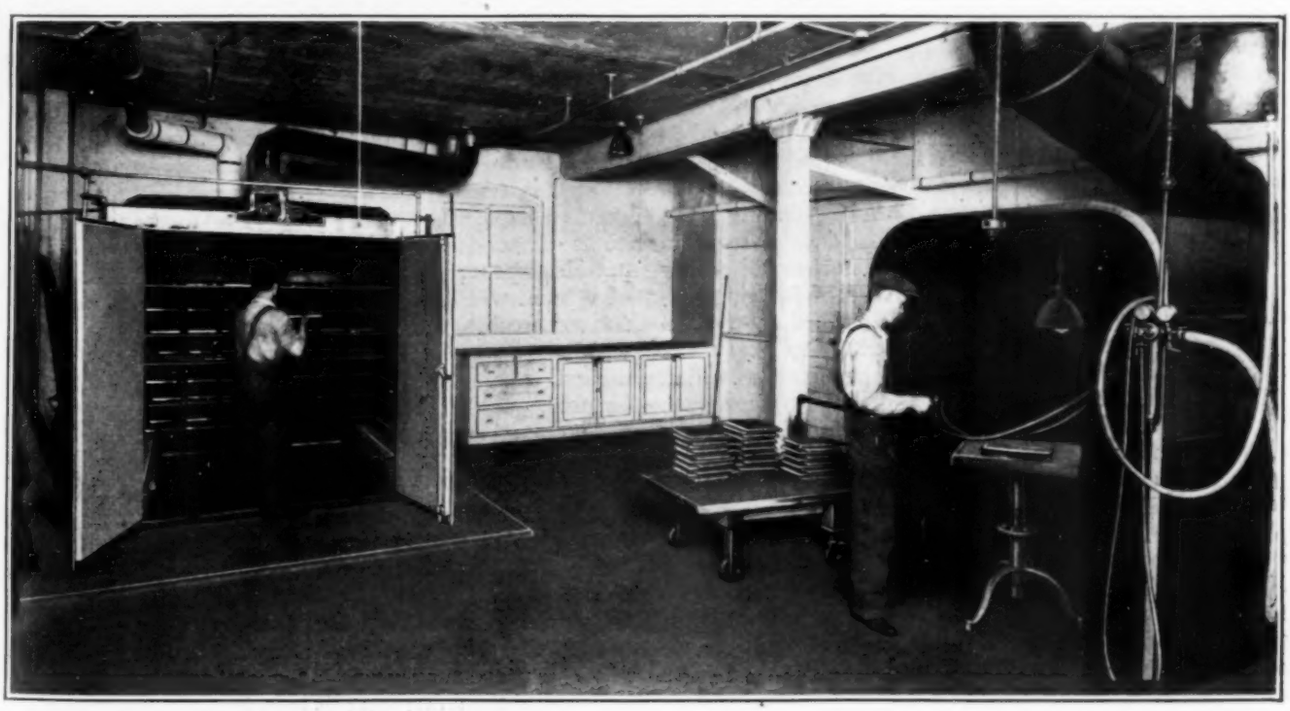


Fig. 1—Paint spraying installation for finishing parts of office machines in color. Due to the volatile nature of the enamel solvents, an exhaust system is recommended, as shown. Heavy machinery is also finished by spraying. At the left is shown a gas-fired oven for baking the parts after spraying. The ovens are made to suit the work

A favorite group of colors for machine tools and production machinery in machine shops is gray. Gray is an inconspicuous color, and easily harmonizes with other surroundings. At the same time, it has a more sanitary appearance than the dead black finishes. Gray is usually produced by tinting white with black pigments, and can, therefore, be made in many shades. Special light-gray machinery enamels have been made to retain many of the good points of the black finishes, while at the same time giving the cleanly appearance of the white without having the out-of-place appearance that plain white has in the machine shop. These machinery grays are also oil-proof and water-proof, and are durable in service. Another group of colors that is finding a wide variety of uses in mechanical parts is the browns. Brown is an inconspicuous color, and the light shades have all the advantages of the grays, but they do not have the same pleasing appearance when covering large surfaces or entire machines. They are used largely for small parts and trims. There is no fixed rule for the choice of colors on tools and machines. New color schemes are constantly being developed, and wider fields of application are constantly opening. However, certain colors have in some cases been adopted as standard for certain types of machines. For example, slicing machines and certain other varieties of machines used in stores are usually colored a bright red. A manufacturer of knitting machines is using a green enamel, while a maker of blueprint machines is painting his product olive green. A maker of a line of cotton-mill machinery is using a dull yellow, with red for the trim, and also red for such accessories as pulleys. Another mill-machinery builder puts on the finishing coat of a color to suit his customer's plant scheme, a favorite being a dark green with red trim. Red has also been used for air compressors and power plant machinery. In general, the metal-working machinery builder has not gone in for bright colors on his product, but many buyers are re-painting the machines to suit their own ideas. Various shades of red are often used, with preference for maroon, since this is a harmonious and inconspicuous color. Sometimes two or more colors are employed.

Practically all colors have been used for small tools, and one manufacturer will use numerous color schemes for his products. Hammers have been tipped with red. Shears are made with blue, ivory or maroon grips, and some tire tools have been colored purple. Even pulleys supplied to the millwright have been painted red or olive-green. In the finished products turned out by manufacturing plants, there is no limit to the variety of color. Electric drills are being made in bright colors, or in two tones. Pumps may be green or other colors, or have two colors. Hardware of all kinds is being made in color, and the manufacturers of automobile equipment have had to meet the new color requirements of the automobile trade by supplying such things as red shock absorbers, or various-colored jacks and tools. The manufacturer when choosing a type of finish for his product has four distinct fields which he may enter. The old-fashioned, slow-drying paints and enamels are still used where time is not an important factor. They are the cheapest of all the finishes, and are easy of application. Moreover, they can be readily thinned out with the ordinary reducers, such as turpentine and benzine. A second choice brings in the newer, quick-drying varnishes and enamels. These finishes are hardened to serviceable coatings by exposure to the air in from two to three hours, and will be hard enough in twenty-four hours to permit shipping of the article coated. Enamels of this class are suited to all kinds of work, except on articles that will be subject to outside exposure. In many cases, one coat of this class of enamel will be sufficient to give full finish, although for some colors and conditions, two or even three coats will be necessary. With these enamels also, turpentine, mineral spirits, benzine, and other common reducers can be used.

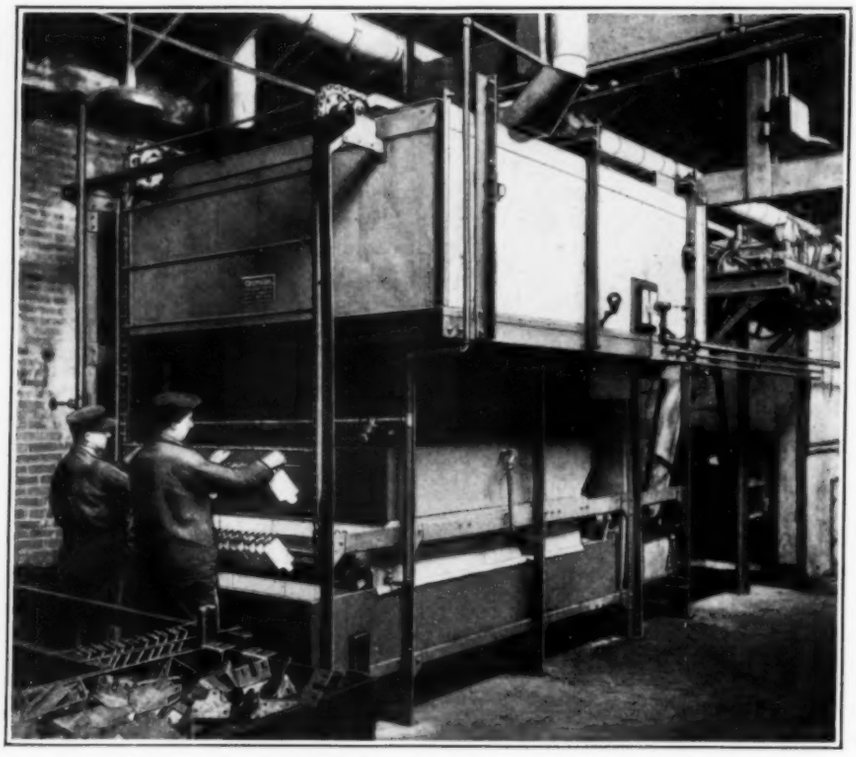


Fig. 2 — A special oil-fired conveyor oven arranged for cleaning, rinsing, drying, baking, and cooling the parts that are being enameled. The operators are shown loading and unloading the oven

The new lacquers constitute another group of finishes from which the manufacturer has to choose. These lacquers consist of a base of nitro-cellulose, cellulose acetate, or corresponding material, a gum, and a solvent such as an alcohol, an acetate, benzol, toluol, or a mixture. When applied they will dry in half an hour, or even less time. They should not be confused with the Oriental lacquers that were slow-drying varnishes and had poor wearing qualities. Lacquers can be obtained in any color, but they usually do not have a heavy body, and more than one coat is required. They have the advantage that they can be polished on a wheel, but they are not considered as durable as the former class of quick-drying enamels. These lacquers can be sprayed

on readily, but the solvents and reducers are volatile, with the result that there is likely to be considerable waste. Both the lacquers and the reducers are also more expensive than any of the other classes of finishes.

The use of baked enamels has not been reduced by the advent of the new enamels and lacquers. Baking enamels and japans are more elastic and weather-resistant than air-drying finishes. In fact, any air-drying enamel will be more durable if baked than if air-dried. Baking accomplishes in a few hours what air drying does in many days. Consequently, the tough, wear-resisting surface obtained from a slow-drying finish may be obtained in a much shorter time by baking. The important advance in finishing that has permitted the continuance of baked enamel finishes in direct competition with quick-drying finishes has been the development of continuous automatic equipment for the work. Practically all baking of enamel on a production scale is now automatic or semi-automatic. Conveying systems handle the parts to the dipping tanks and directly into the oven. The conveyors are timed to give the proper period of heat in the oven, which is usually about two hours, and then to deliver them at the opposite end. Parts thus finished and baked are immediately ready for packing, and do not require any additional space for storage, whereas for even the quick-drying enamels, much room is required for storing the parts during the drying process.

Fig. 3—Overhead runway system for handling large machine parts to be enameled by dipping. The battery is arranged for three-coat work, two of the dipping tanks being shown at the sides. After dipping the work passes through the ovens which can be seen in the background

If the finish is to be baked, the material of which the part is made, and also the color of the finish desired, will govern the temperature at which the baking can be done. In general, most metal articles will stand temperatures up to 350 deg. F. without injury, which is the usual maximum temperature used on black enamels and japans. For such parts, however, that will not stand this temperature, the same results can be obtained by reducing the temperature to as low as about 200 deg. F., and increasing the time in the oven. On the other hand, for articles that will stand higher temperatures the time in the oven can be reduced to as low as 30 min. by increasing the temperature of baking.

Usually, black baking enamel will stand high temperatures, and, consequently, the finish on the completed article will have better wearing qualities, and will withstand hot liquids. But the pigments in colored baking enamels generally will not stand high temperatures, and, as a consequence, must be baked at a lower heat, usually 150 to 180 deg. F., for a longer period of time. In choosing a finish for metal parts, it is sometimes found that either the reducer or the body material in certain finishes is likely to react with some non-ferrous metals, such as brass or zinc. To save spoiled work and the needless loss of time, it is usually advisable, therefore, for the manufacturer when purchasing an enamel or finish, to state definitely for what the finish is intended. In such cases, it may be necessary to alter the finish or to apply an undercoat that will not react with the metal. Furthermore, in choosing a given luster or tone, co-operation with the finish manufacturer is also necessary, since the same finish will give different tones and different lusters with variations in the time of baking, differences in the undercoats, or other factors. The size of the article to be finished is a most important factor in choosing the class of finish to use. Most of the automobile builders have now gone to lacquer finishes, which give a good appearance and have a satisfactory durability in proportion to the length of life of the car. In addition, these finishes make it possible to offer a wide range of color schemes. But it will be noted that the manufacturers of motorcycles in general are retaining baked finishes. This is due to the fact that the parts of motorcycle frames are small enough so that they can be handled by automatic dipping systems and passed conveniently through automatic ovens. The material of which they are made, also, makes it possible to bake them at a high enough temperature so that the time of baking can be cut down to a length of not over two hours. This compares favorably with the drying and hardening time of lacquers, and gives a resulting finish that is tougher and more durable, and one that will stand up better under the rough treatment accorded to motorcycles.

In general, the complete cost of a finish for a given article is so small in proportion to the total cost of the article that the manufacturer can afford to spend considerable effort and time in arriving at just what he desires in the matter of color, luster, and durability. Even the small, low-priced tools and mechanical parts can be given attractive finishes at small cost in proportion to their value. For machinery finishes the number of coats required will most frequently depend upon the color, but it does not pay to skimp, and a priming and an undercoat should precede the final finish when needed.

For small tools and supplies the color finish may be of enough relative importance to affect sales, but for the average expensive machine the choice of the buyer is not likely to be influenced by the color, since he can readily paint the machine to meet his own ideas. But the ease of application of modern finishes is now making it possible for the machine builder to offer a selection of colors without upsetting his production routine.

· BOOK · REVIEWS ·

FOUNDRY WORK. By R. E. Wendt, head instructor in foundry practice, Purdue University. Second edition. Two hundred and thirty-six $7\frac{1}{2}$x$4\frac{3}{4}$-in. pages, indexed, 193 figures, 10 tables and glossary. Cloth boards. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $2.

BOTH the student of engineering and the shop apprentice may profit from a study of this book, in which the author has presented the fundamentals of foundry work in such a simple and direct style, coupled with adequate illustrations, that it is a pleasure to read and is fully understandable. No doubt, the average engineer will find sufficient material on the molder's art to meet his needs, and the chapter on the problems of foundry managers should be valuable. On the other hand, this entirely practical treatise furnishes the apprentice with a means to become acquainted with the best practice in the several branches of molding. Highly technical descriptions have been avoided, so that he can read the work with complete understanding.

As is proper with a book of this nature, the subject is first treated in Part 1 with regard to the fundamental principles. The first nine chapters deal with the foundry product, branches of molding, molding sands, flasks, gating molds, shrinkage in castings, gaggers, chaplets, and molding tools. Part 2, Chapters X to XV, inclusive, is devoted to such topics as bench molding, floor molding, molding machine practice, metal patterns, and drysand core-making. The operations of melting and mixing ferrous and non-ferrous metals are described in Part 3, Chapters XVI to XX, inclusive. Part 4, Chapter XXI, contains a discussion on the foundry manager's problems from the layout of a foundry floor plan to computing the cost of castings.

S.A.E. HANDBOOK, 1928. Six hundred and fifty-three 7x4-in. pages, thumb indexed. Flexible leather covers. Published by the Society of Automotive Engineers, Inc., 29 West 39th Street, New York, N. Y. Price to non-members $5.

THIS handbook as brought up to date, contains more than six hundred standards and recommended practices of the society. Standards for both design and production promulgated by committees are presented. In addition, an advertisers' section of manufacturers producing parts made in accordance with S.A.E. specifications is appended.

FACTORY ORGANIZATION AND MANAGEMENT. By Ralph Currier Davis. Four hundred forty-nine pages, 6x9 in., cloth board covers. Indexed. Published by Harper & Brothers, Publishers, New York, N. Y. Price $5.

IN THIS book the author has set out to give a broad picture of fundamental principles and functions of factory management for the use of executives and students of industrial management. He has succeeded in making the book thorough and comprehensive, while at the same time bringing in sufficient detail to make each problem completely understandable. Beginning with a chapter on the history and development of modern management, he leads the reader progressively through the important functions of industrial management in a highly interesting manner. On the other hand the book is so divided into group chapters and cross indexed that it provides a handy reference book on management problems.

There are twenty-nine chapters in the book, covering such subjects as: Plant location, equipment, lighting, heating, organization, systems, time study, production control, planning, routing, materials control, personnel, stores, salvage, employment, costs, and medical supervision. The important points are well illustrated, and 133 cuts are used to show forms and charts, as well as 28 halftone illustrations. The book should form a valuable encyclopedia on management for the average plant executive.

AIRCRAFT YEARBOOK, 1928. Five hundred and fifty-one pages, 6x9 inches. Published by the Aeronautical Chamber of Commerce of America, Inc., New York, N. Y. Price $5.25.

THIS is the tenth issue of the yearbook and it gives an excellent picture of the growth of the airplane industry in that time. The outstanding feature of the volume is the chapter devoted to the flights of Lindbergh, Chamberlain, Hegenberger, Maitland and others and forms an interesting record of these achievements.

Modern plane development is shown in considerable detail and there is much general information as to landing fields, lighting and other equipment. Engines, instruments, lighter than air developments and other details also receive considerable attention. There are many data as to the air activities of the government departments, airway bulletins and a list of licensed pilots. As a reference book of aviation activities it is indispensable.

BUSINESS WITHOUT A BUYER. By William Trufant Foster and Waddill Catchings. Two hundred and five pages, $5\frac{1}{2}$x8 in. Cloth boards. Published by Houghton Mifflin Company, New York, for the Pollak Foundation for Economic Research, Newton, Mass. Price $2.

THE authors of this book are not content to accept business depressions as inevitable. They believe there is a way out. In their analysis of the situation they point out that consumers are in constant fear that they cannot get enough, and producers in constant fear that they will produce too much.

The authors conclude that the goods cannot be sold because the people who want to buy them lack for money. And, since under-consumption is the chief cause of all of our troubles, adequate consumer income is the chief remedy. We must see that the people receive enough income week in and week out in addition to what they save, to buy all the finished products as rapidly as they are ready for sale. We must provide as effectively for financing consumption, as in the past we have provided for financing production.

The authors show clearly that high wages alone are not the remedy, and promise to propose a simple and immediate way out in a book to be published in the near future. The present book puts in simple and brief form, the substance of the authors' two previous books "Money" and "Profit." Many will disagree with some part of the theory presented, but all will find it very interesting and stimulating reading.

Noise *Does* Impair Production

By Prof. Donald A. Laird
Psychological Laboratory, Colgate University

The noise problem can be attacked on three fronts: it can be reduced at the source, its transmission through structures can be impaired, and it can be absorbed

THERE is a very important engineering rating that is too commonly overlooked when a new machine is bought, that is its *noise coefficient*. Also, in purchasing a new building the buyer should determine the *noise absorption* of the structure.

Noise is a very common thing in workplaces, and an expensive matter. It cuts into output at times by as much as thirty per cent. Experiments in the psychological laboratory of Colgate University indicate that mental work is cut down more than repetitive manual work by the presence of noise of average industrial intensity.

No indications have been found that workmen "get used to noise" in the sense that their output goes to the same level it would if the noise were absorbed. They may get so that they ignore its presence, just as a chemist ignores the smells of hydrogen sulphide: but noise remains to affect their output, just as the chemicals still affect the nose of the chemist. Most executives have two misconceptions about noise in industry: The first, just mentioned, is the ill-founded belief that, after all, noise does not affect production. The second misconception is that noise is a necessary evil and that there is no scientific basis for controlling or absorbing it. Noise does cost, and most of it can be controlled for all practical purposes. It is only within the last twenty years, however, that acoustical control has been placed on a scientific basis. There is still a great deal of quackery in the field, and many unjustified claims are being made, by manufacturers. To control noises so that a public auditorium has perfect acoustics is a difficult, but not an impossible problem. To make a factory room or office quieter is not such a difficult task, but is still one subject to many mistakes, as the experience of almost any plant engineer will show. Plant noises are a two-fold menace: they are a hazard in their immediate locality and they also extend to other parts of the plant at a speed of 1,088 ft. per sec. in air and more than ten times this rate through brick. Most executives, for instance, are quiet, but most executive offices are noisy on account of the infiltration of noise from other parts of the works. This condition is true even for the office in a business section entirely removed from the works, but where traffic noises pour in through open windows, or, strange as it may seem, through minute crevices around the windows.

Noise must be attacked from three fronts: its generation, transmission, and reception. Much noise can be conquered at its source. Noiseless gears, chain belts, and canvas-tired truck wheels will engineer more quiet into workplaces. Heavy and noisy machinery that makes the building vibrate—a form of noise transmission not mentioned previously—can be muffled somewhat by mounting the machine on a base of resilient sound-absorbing material. Some machines, by the nature of the work they do, cannot be quieted as readily. Punch presses, saws, riveting operations, and even addressographing machines are intrinsically noisy by the very nature of the operation itself. Such machines should be isolated as far as possible to keep their noises confined and absorbed within a limited area. In one plant a single riveting machine disturbed a great area by being placed in an L-shaped room so that its terrific noise was equally distributed throughout the room. In this particular large room the noise intensity was at 85 units, due almost entirely to this one machine. How great this intensity is may be

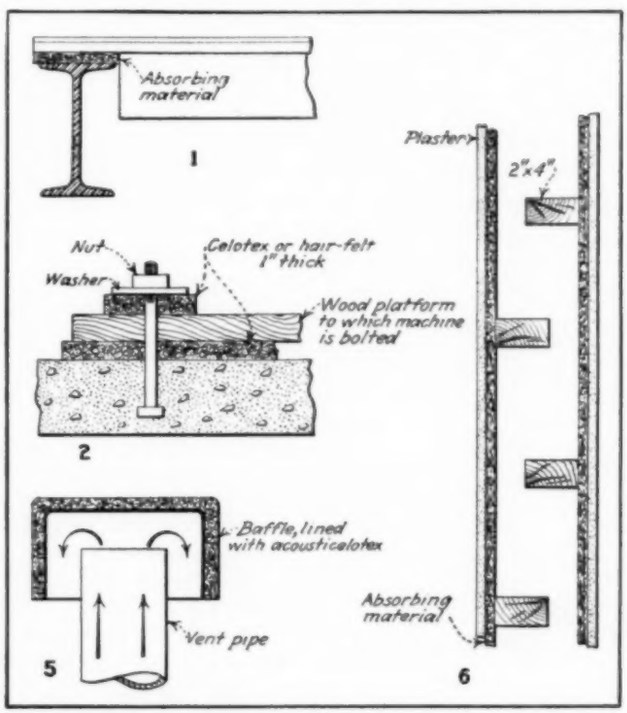


Fig. 1—One method of stopping transmission of noise through floors of a steel and concrete building. Fig. 2—A machine mounting of this type will prevent the spread of noise through floors. Fig. 5—Noise can come into a room through the ventilating system. Acoustical baffles should protect both entrance and exit ducts. Fig. 6—The duplex construction eliminates the "drum-head" effect

realized from the fact that if a man were to stand beside an eight-cylinder airplane engine running at three-quarter speed and without a muffler, he would hear noise of about the same intensity.

Industrial noise has also to be attacked from the point of view of transmission through media other than air. This is the second front. Noises are conveyed more rapidly through a wooden floor than through the air, and still more rapidly through a concrete floor. Vibrations from machinery may readily be transmitted several floors or rooms away unless there is a break in the continuity of the floor materials and padding at the joists. In eliminating noises from this approach, the engineer has to bear in mind both the mounting of machinery and the isolation of room floors by padding. In most offices trouble does not come from this source, unless the office is in the same building with the manufacturing plant. In plants where there are no high-speed machines nor heavy operations being performed, transmission is not as a rule important. Transmission of noises and other vibrations through floors can be stopped to a useful extent by a construction such as is shown in Fig. 1 for a steel and concrete building. A machine mounting of the type shown in Fig. 2 will prevent the spread of some of the noise through floors, where it travels eleven times as rapidly as in open air. Presses weighing several tons have been successfully mounted in such a manner. This construction also adds to the life of a building.

The third, and apparently most hopeful, front on which noise has to be attacked, is that relating to reception. Sound may be either absorbed or reflected, or part of both effects may occur. Ordinary wall surfaces build up noise intensities of machinery by prolonging the reflection of the noise from wall to wall until, after unnumerable reflections, it becomes inaudible.

In a plastered office, for instance, with ceilings 18 ft. high and a floor space roughly 30x40 ft., a hand clap can be heard for five seconds after the hands have been struck together. This is the period of reverberation. The machines in such a room, which is typical of most rooms, will sound much noisier than they actually are because the reverberation keeps the sound alive for several seconds. To lower the reverberation period it is necessary to have a wall surface that will absorb the sound energy by changing it into heat (imperceptable, of course).

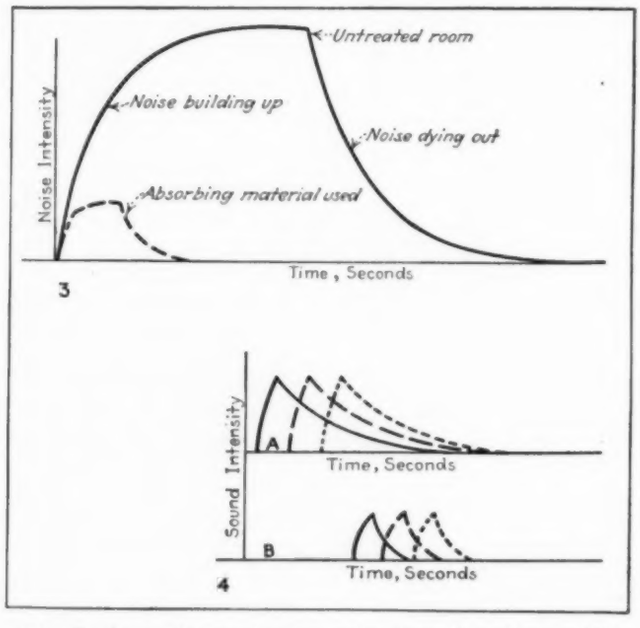


Fig. 3—In a plastered room noise intensity rises rapidly due to reverberation. Fig. 4—Effect of reverberation on the clarity of speech in two types of rooms

Common plaster absorbs scarcely two per cent of the noise that strikes it. Consequently, a plastered room is as noisy as can be. If the office is fitted with extra-heavy oriental rugs, they will quiet the room as such rugs absorb about 29 per cent of the noise striking them. There are less expensive and more effective ways, however, of absorbing noise. Absorption coefficients for common wall coverings per sq.ft. of material are given in the accompanying table.

Open window	1.00
Acousticelotex, 1½ in. thick	0.70
Akoustolith (artificial stone)	0.36
Brick wall, 18 in. thick	0.032
Carpet rugs	0.20
Concrete	0.015
Cork tile	0.03
Cretone cloth	0.15
Flax, 1 in. thick	0.55
Glass (window)	0.27
Hairfelt, 2-in. thick with painted membrane	0.40-0.60
Insulite, ½ in. thick	0.31
Linoleum	0.03
Plaster	0.03
Varnished wood	0.03
Individual person	4.7

The noise condition in the plastered room is shown by the solid curve in Fig. 3. A single sound rises slowly to a maximum loudness, and dies out slowly. The same room with the walls made more sound absorbent is shown by the broken line. Here the up-building period of reverberation is quickly reached, and it dies out as rapidly. The result is a quieter working place.

Why is it difficult to understand orders in some rooms? The upper diagram *A*, Fig. 4, shows how, in a plastered room, the reverberation of one spoken word is still audible when the next word (broken line) is spoken. In a room that is designed so that it will absorb sound, we have the effect shown in the lower diagram *B*. Here the first word (solid line) rises to a maximum loudness rapidly and starts to fade away before the second word is spoken. There is no "ghost" of the first word lingering in the air to confuse the word that follows.

Attention should also be called to the fact that a great deal of noise can be carried from a noisy room to a quiet room through the ventilating system. Acoustical baffles, such as shown in Fig. 5, should protect both entrance and exit ducts.

Partitions are prone to act like a drum head in transmitting noise vibrations from one room to another. The plan section of a supporting partition shown in Fig. 6 is a duplex construction, which stops this "drumhead" effect. Additional noise control can be gained through loose strips of absorbing material hung in the space between the walls.

The old favorite idea of stretching wires to "cut up the sound" is entirely without justification. There is no evidence that wires better the carrying powers of auditoriums or that they make workplaces quieter.

The only solution of the problem of industrial noise is to choke off all possible noises at the sources, and to absorb the remainder by wall design. Laboratory records indicate that if this is not done, noise that is above 40 units intensity ought to be included in the cost accounting.

Equipment Makes Possible the Ford Model A

Machining and welding operations on the Differential Ring Gears Steering Gear Mechanism *Assembly of the* Steering Gear and Wheels

By Fay Leone Faurote, M.E.

IT WILL be remembered that in the first part of this article, a description was given of the fabrication of the tubes for the housing of the rear axle-shaft; how the bells were formed by hot rolling in a special machine; how the differential housing was formed from channel steel; how the sleeve was welded to the differential housing in machines that required three men to operate; and of an automatic welding machine for this same job, designed and built at the Ford plant.

This, the second part of the article takes up the production of the differential ring gears; the drive-shaft housing tubes; the steering mechanism, and the wheels. Operation sheets are given of these parts, showing in detail the machines employed and the quantity produced in each operation. The differential ring gears are made from steel rolled in the Ford mill. They are cut to length and formed into rings on an Ajax machine. Afterward, they are welded, machined and then the teeth are generated. They are more economical than solid forgings and are apparently just as good.

The drive-shaft housings consist of tubes to which the flanged forgings on the differential ends and the ball forgings on the transmission ends, are flash welded. To insure permanent alignment and rigidity, the tubes are finish machined in line after the welding has been done. The two rear radius-rods have terminal forgings flash welded at each end. The front radius-rod has a front terminal forging flash welded to the front end, and a yoke forging to the rear end. The equalizer brake shafts are made of two forgings each, welded to the ends of the bars, right and left. Other examples of welding are the foot pads for the brake and clutch pedals, which are welded to their respective forgings, also the brake rods which are welded to their terminal forgings. Electric welding is also employed in the manufacture of Ford all-steel wheels. The

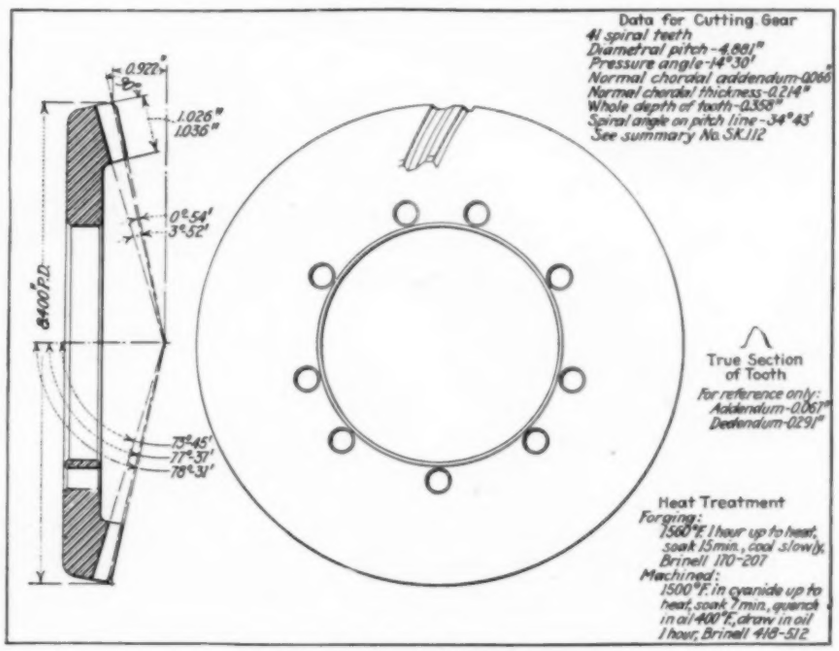
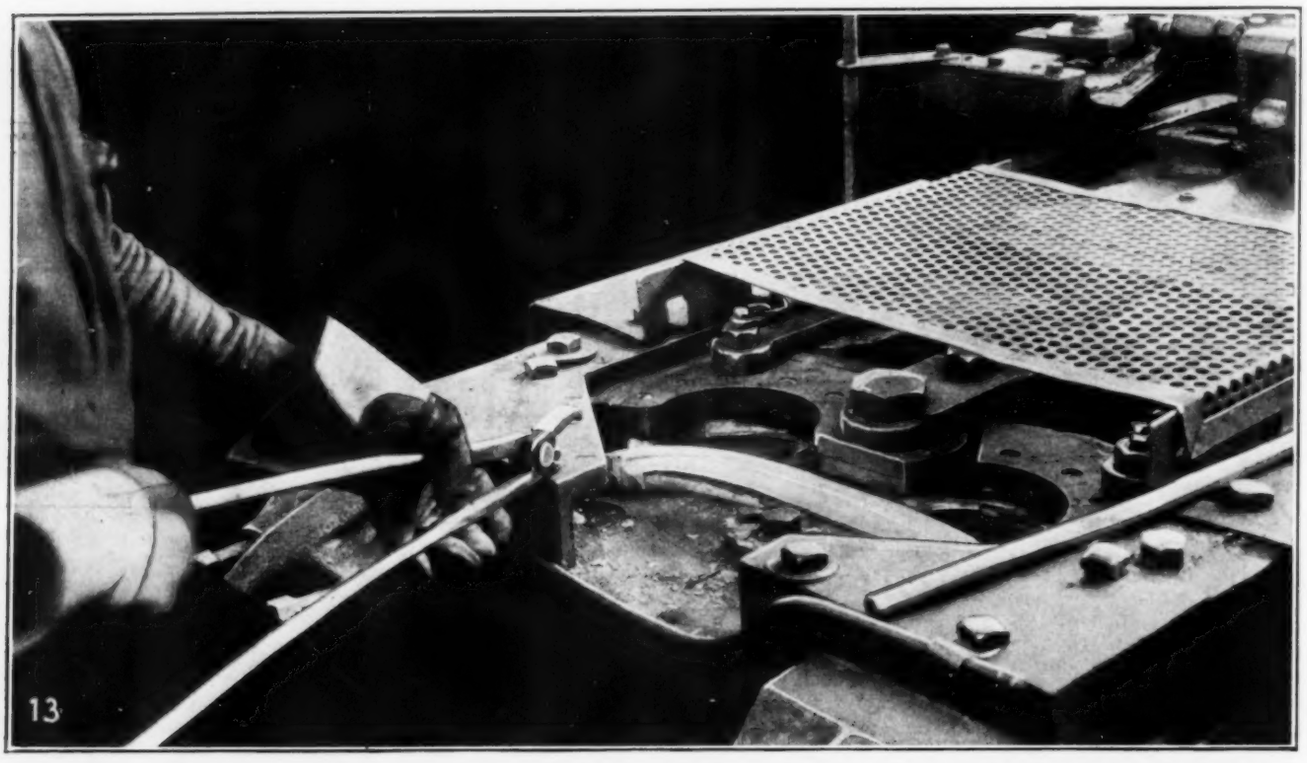
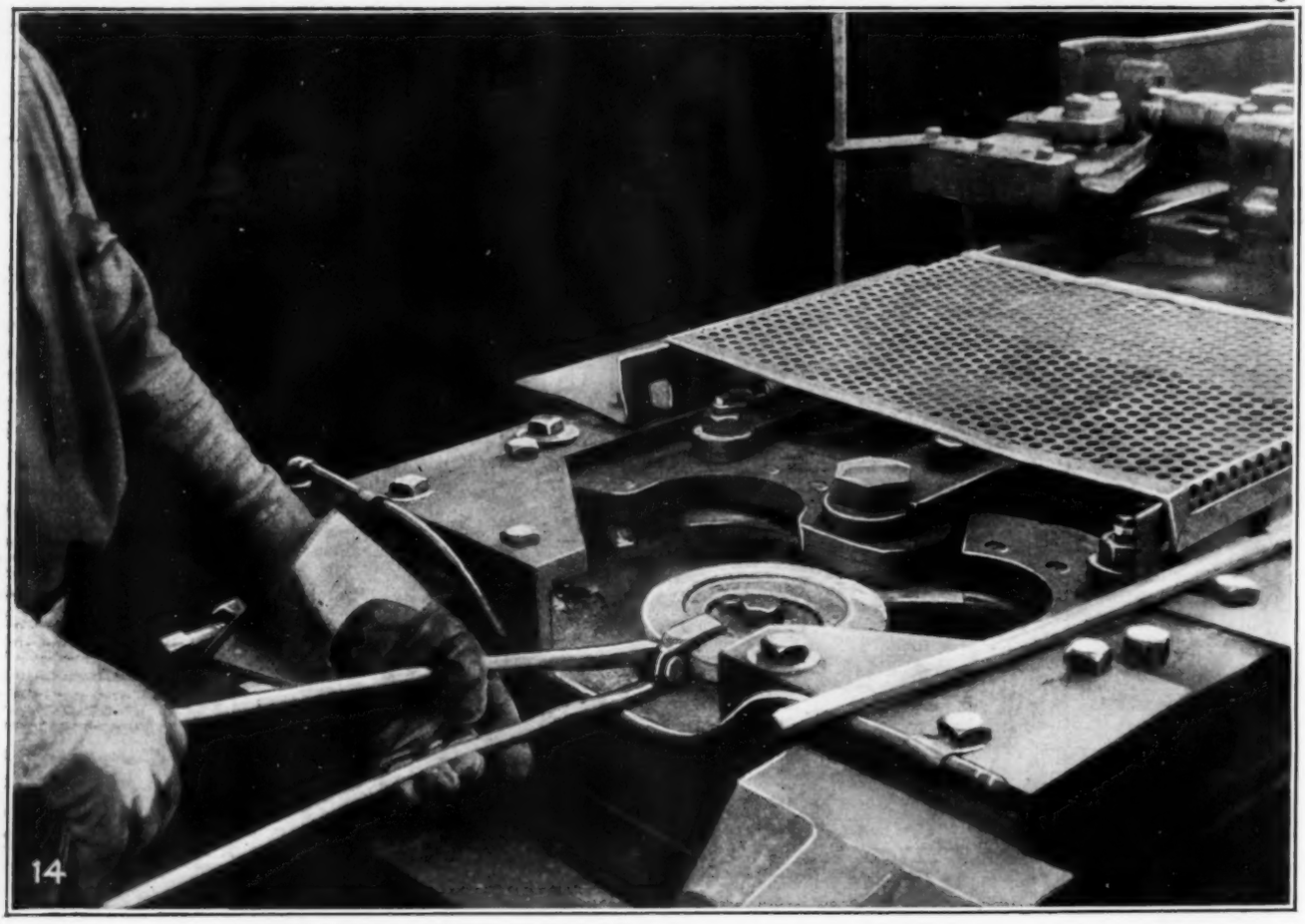


Fig. 12—Differential driving gear

Conclusion of the article.





Figs. 13 and 14—Forming the differential ring-gear in a special bending machine

Fig. 15—Welding the differential ring gear

hub shells are blanked and formed in seven operations on punch presses; the rims are strips of steel formed into circles and flash welded together, after which they are rolled, formed and embossed. The spokes are cut off, upset, and cupped on cold-heading machines, direct from coils of steel wire. The rims are placed in special welders and ten short spokes of the same angle are welded in place, one at a time. The machine indexes and welds automatically. Next, the ten short spokes of the opposite angle are welded in other machines of similar design. The hub shells are assembled and welded to the spokes in two separate operations. The long spokes are welded to the outer rims and then to the hub shells. The five Ford wire-wheels complete weigh 36 lb. less than four wooden wheels and a spare rim.

Differential Driving Gear Operation Sheet

No.	Operation	Machine	No. per Hour
1-A	Cut to length	No. 57 Special Toledo press	400
2-B	Shear end	P-5 Ferracute press	400
3-C	Heat	Walking-beam type gas furnace, 1950° F.	500
4-D	First bend	No. 3 Ajax bulldozing machine	375
5-E	Second bend	No. 4 Ajax bulldozing machine	375
6-F	Flatten	No. 57 Toledo press	400
7-G	Weld ends together	Ford flat-top welder	375
8-H	Trim outside flash	P-3 Ferracute press	400
9-I	Trim flash from top	P-3 Ferracute press	400
10-J	Face off side of weld	21-in. single-spindle Cincinnati drill—wet table	400
11-K	Trim flash from bottom	P-4 Ferracute press	400
12-L	Trim flash from inside	P-3 Ferracute press	400
13-M	Restrike	No. 664 Toledo press	400
14-N	Normalize	Pusher-type furnace	270
15-O	Tumble	28-in. x 19-ft. Sly tumbler	1,000
1	Rough bore, face and counterbore, finish face, chamfer and ream	14-in., 6-spindle Bullard, old style	40
2	Drill and ream nine holes	No. 15½ Foote-Burt drill	80
3	Finish turn	14-in., 12-spindle Bullards	70
4	Countersink both ends	21-in. Reed-Prentice, single-spindle drill	300
5	Stamp "Ford"	No. 11 Dwight Slate marking machine	1,800
6	Face web	1x5 Reed-Prentice lathe	30
7	Rough teeth	15-in. Gleason spiral bevel gear rougher	4
8	Remove burr	Ford special burring machine	300
9	Cut teeth	8-in. Gleason bevel-gear cutter	7
10	Inspect	18-in. Gleason gear tester	75
11	Harden	Cyanide pot	320
12	Oil draw	Furnace	313
13	Inspect	Steel City testing machine	...
14	Burr	Ford special polishing machine	375

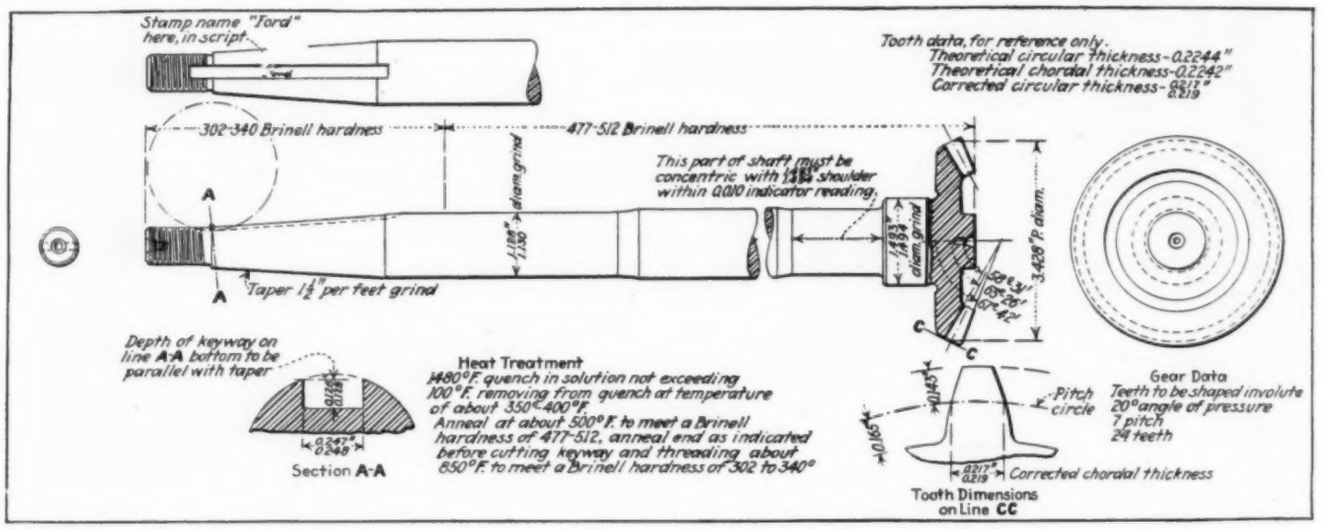

Stamp name "Ford" here, in script
Tooth data, for reference only.
Theoretical circular thickness-0.2244"
Theoretical chordal thickness-0.2242"
Corrected circular thickness-0.219"
302-340 Brinell hardness
477-512 Brinell hardness
This part of shaft must be concentric with shoulder within 0.010 indicator reading.
Taper 1/2" per feet grind
Depth of keyway on line A-A bottom to be parallel with taper
Section A-A
Heat Treatment
1480°F. quench in solution not exceeding 100°F. removing from quench at temperature of about 350°-400°F.
Anneal at about 500°F. to meet a Brinell hardness of 477-512, anneal end as indicated before cutting keyway and threading about 850°F. to meet a Brinell hardness of 302 to 340°
Gear Data
Teeth to be shaped involute
20° angle of pressure
7 pitch
24 teeth
Pitch circle
Corrected chordal thickness
Tooth Dimensions on Line CC

Fig. 16—The rear axle-shaft, including data for heat-treatment and for the gear teeth

Differential Driving Gear Operation Sheet (Cont.)

15	Grind bore	No. 15 Bryant internal grinder	80
15½	Lap tooth surface	18-in. Gleason lapping machine	...
16	Wash	Niagara washing machine	625
17	Final inspection	18-in. Gleason gear tester	100

Steering Spindle Operation Sheet

No.	Operation	Machine	No. per Hour
1	Snag	1½-in. Norton grinder	750
2	Heat-treat. Quench	Gas furnace and conveyor	750
3	Anneal	Gas furnace	750
4	Pickle	Tank, 8x6x5 ft.	2,000
5	Center	Single-end Ford centering machine	350
6	Turn 5-in. face and shoulder	No. 0 x 5-ft. Reed-Prentice lathe, back geared. Cutting speed cut down to 80 per min. on 5-in. diameter	40
7	Rough turn bearing end	14-in. x 4½-ft. Reed-Prentice lathe	100
8	Finish turn bearing end	14-in. x 4½-ft. Reed-Prentice lathe	100
9	Rough turn taper end	14-in. x 4½-ft. Reed-Prentice lathe	75
10	Straddle mill arm, 1¼-in. boss	2-A Milwaukee mill, water pump attachment with table	100
11	Drill 31/32-in. hole	No. 2, 4-spindle Colburn drill, wet table. No tapping attachment	60
12	Ream 1-in. hole	21-in. Cincinnati drill, wet table, single spindle, stationary head. No tapping attachment	200
13	Drill 3/16-in. hole	14-in., 3-spingle Leland-Gifford drill, sliding head, variable speed, wet table automatic power feed	350
14	Drill 5/16-in. tap hole	14-in. Leland-Gifford drill, 3-spindle, single head, variable speed, wet table, automatic	400
15	Drill 0.749-in. hole	No. 2, 4-spindle Colburn drill, wet table, heavy heads, 2½-in. spindle. No tapping attachment, 192 r.p.m., 2-in. feed	190
16	Ream 0.750-in. hole	21-in. Cincinnati drill, wet table, stationary head. No tapping attachment, fixed speed 250 r.p.m.	250
17	Chamfer 0.750-in. hole	20-in. Cincinnati drill, stationary head. No tapping attachment, wet table, fixed speed at 268 r.p.m.	200
18	Straddle mill 15/16 and 1-1/16-in. lugs	No. 2-B Milwaukee mill, wet table, equipped with individual water pump	75
19	Tap 5/16-in.—32 hole	No. 2 Garvin automatic tapper, wet table, single spindle, single head	400
20	Drill four 25/64-in. holes	Single-head vertical Foote-Burt drill equipped with inverted spindle head, sliding head, fixed speed, wet table	200

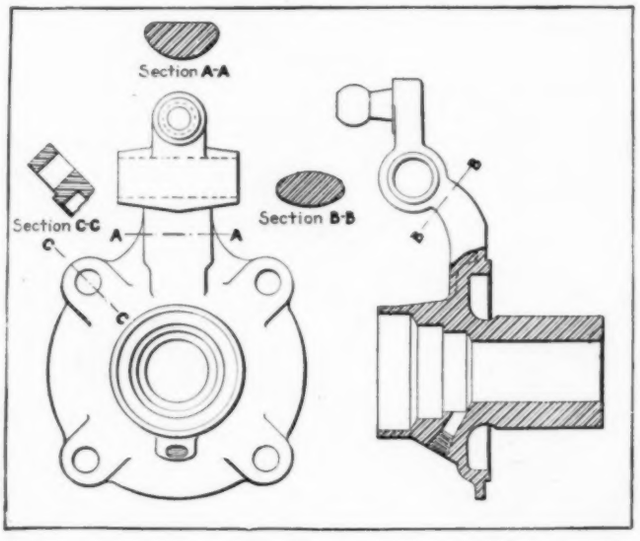


Fig. 17—Assembly of the rear axle-shaft housing flange

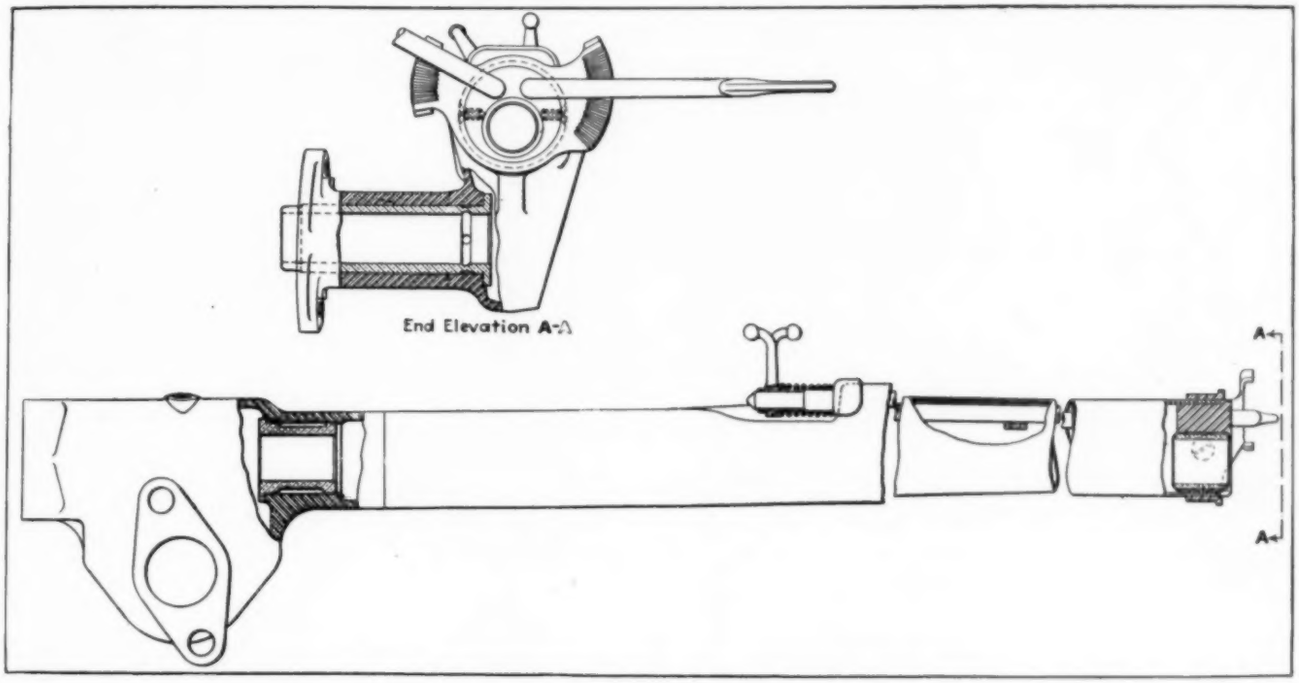


Fig. 18—Steering-gear housing and column assembly

21	Mill 3-in. diameter	No. 2-A Milwaukee mill, wet table, equipped with individual water pump	100
22	Drill 3/16-in. pin hole	D-6 Kent-Acme drill, 6-spindle, wet table, equipped with individual water pump	200
23	Thread ¾-in.—16	Special Illinois threaders, wet table, equipped with individual water pump	100
24	Mill slot	No. 34 Oesterlein mill	150
25	Spot two ¼x1/16-in. holes	21-in. Cincinnati drill, wet table, single head, no tapping attachment, fixed speed	100
26	Burnish	Ford machine for rolling bearings on spindles	500
27	Assemble	Special Ford machine with nut driver, dry table, hand feed	500

Steering Gear Housing Assembly Operation Sheet

No.	Operation	Machine	No. per Hour
1	Butt weld flange to gear housing	Ford butt welder. Air clamping fixture	200
2	Rough drill 1-3/32-in. hole	No. 2, 4-spindle Colburn drill, wet table	200
3	Bore and ream ¾-in. hole, spot face	No. 4 Warner & Swasey screw machine, wet pan, individual pump	50
4	Drill 3/16-in. oil hole	20-in. single-spindle Cincinnati drill	200
5	Remove flash	14-in. x 4-ft. Reed-Prentice lathe, no taper attachment. Chip pan, tailstock	200
6	Arc weld seam (top)	Ford arc-welding machine	62.5
7	Arc weld seam (botttom)	Ford arc-welding machine	40
8	Remove flash	No. 35 Ransom grinder	...
9	Bore and ream 1.687-in. diameter and 1.312-in. diameter counterbore	No. 4 Warner & Swasey screw machine, wet pan	50
10	Bore one 15/32-in. diameter and face and turn 13/14-in. diameter	No. 4 Warner & Swasey screw machine, wet pan	50
11	Drill two 29/64-in. holes in flange	21-in. Reed-Prentice single-spindle drill, wet table	150
12	Mill cover hole	Gould & Eberhardt rotary mill, wet, individual pump	125
13	Drill three ¼-in. holes	21-in. Reed-Prentice drill, wet table	175
14	Tap three ¼-in. holes	21-in. Cincinnati single-spindle drill, reversible head	175
15	Drill four ¼-in. tap holes	21-in. Reed-Prentice drill, single-spindle	100
16	Tap four ¼-in. holes	21-in. Cincinnati single-spindle drill, reversible head	150
17	Drill ⅛-in. pipe-tap hole	20-in. Cincinnati single-spindle drill, wet table	162
18	Tap oil hole	No. 2 Garvin tapper, wet table	150
19	Mill radius on flange	No. 33 Kempsmith mill, wet table, automatic stop	125
20	Mill inside of flange	No. 3 Garvin miller, wet table	90
21	Remove burrs from two 29/64-in. holes	Bench, hand operation	312

Steering Worm Gear Sector Operation Sheet

No.	Operation	Machine	No. per Hour
1	Cut stock to length	P-4 Ferracute press	375
2	Heat	Holcroft electric forging furnace	150
3	Forge	3½ Ajax forging machine	150

Steering Worm Gear Sector Operation Sheet (Cont.)

4	Anneal	Furnace	...
5	Tumble	28-in. x 19-ft Sly tumbler	1,000
6	Mill to length	Pratt & Whitney automatic milling machine (wet)	200
7	Center both ends	Ford centering machine, wet table	312
8	Straddle face and turn	14-in. x 4-ft. Reed-Prentice lathe with back arm, wet pan	30
9	Finish turn	14-in. x 4½-ft. Reed-Prentice lathe, wet pan	52.5
10	Broach square	No. 1 Knowles keyseater	60
11	Coin 1/32 and 0.450-in. chamfers	P-4 Ferracute press	625
12	Mill 25/64-in. slot in square	No. 3 Garvin hand mill, wet wash	625
13	Cut teeth	No. 44 Brown & Sharpe hobber	12
14	Remove burr	Hand operation	...
15	Harden	Cyanide furnace	375
16	Draw	Furnace	...
17	Grind shaft bearing	10 x 24-in. Norton Grinder, individual water pump, wet table	65
18	Brass plate	Plating tank	750

Steering Gear Assembly Operation Sheet

No.	Operation	Machine	No. per Hour
1	Assemble upper bearing, rods and rod cushions. Press in place	No. 12, 6-ton Fox horizontal press	375
2	Drill two 10/32-in. tap holes and countersink	12-in. Leland-Gifford drill	375
3	Tap two 10/32-in. holes	Foote-Burt single-spindle drill	375
4	Put in two 10/32-in. screws	Bench	375
5	Blow out chips with compressed air	Hand operation	...
6	Assemble worm thrust-bearing and shaft	Hand operation	...
7	Assemble worm thrust-bearing	Assembly line, hand operation	375
8	Assemble lower bearing, thrust-bearing and adjust end plate	Assembly line, hand operation	375
9	Assemble sector bushing and bushing lock	Assembly line, hand operation	375
10	Assemble sector and sector washer	Assembly line, hand operation	375
11	Adjust sector for backlash and put in Lincoln dope	Assembly line, hand operation	375
12	Assemble cover gasket and cover to housing and run in screws	Assembly line, hand operation	375
13	Adjust thrust screws for end ply in sector gear	Assembly line, hand operation	375
14	Assemble ball arm	Assembly line, hand operation	375
15	Assemble steering wheel	Assembly line, hand operation	375
16	Assemble light-switch assembly	Assembly line, hand operation	375
17	Inspect	Inspection, conveyor	375

Wire Wheel Rim Operation Sheet

No.	Operation	Machine	No. per Hour
1	Trim ends	P-5 Ferracute press	400
2	Band roll	Special Firestone band-roller	400
3	Weld	No. 60 Federal butt-welder	200
4	Trim flash	Special Vulcan trimmer	400
5	Swage and trim	No. 76½ Bliss press	625
6	Wash	No. 80 Niagara washer	625
7	Oil edges	Pedestal with pan	225
8	Curl edges	No. 95-C Toledo press	225
9	Rough roll	Special Firestone rim-roller	190
10	Second roll	Special Firestone rim-roller	190
11	Expand	Special Firestone rim-expander	250
12	Finish roll	Firestone rim-roller	325
13	Inspect	.....	...

Wire Wheel Assembly Operation Sheet

No.	Operation	Machine	No. per Hour
1	Weld intermediate spokes to rim	Ford spoke welder	65
2	Weld inner spokes to rim	Ford spoke welder	65
3	Weld inner spokes to hub	Ford spoke welder	65
4	Weld intermediate spokes to hub	Ford spoke welder	65
5	Weld outer spokes to rims	Ford spoke welder	65
5-A	Weld outer spokes to hub	Ford spoke welder	..
6	Weld outer spokes to hub	Ford spoke welder	65
6-A	Weld intermediate spokes to hub	Ford spoke welder	..
7	Inspect	Bench	...
8	Clean flash on small end of hub	Ford flash-milling machine	50
9	Hand-clean wheel	Filing stand 20 ft. long	80
10	Pierce valve hole	Ferracute press	375
11	Straighten spokes	Flat-top bench	...
12	Straighten wheel	Straightening fixture	65
13	Face hub shell	No. 25½ Foote-Burt drill, single-spindle	110
14	Ream and burr hub shell	24-in. Cincinnati single-spindle drill, dry table, sliding head	200
15	Inspect	Table	...
16	Wash	Spray washer	650
17	Burn off	Ford burn-off oven	650
18	Spray, prime coat	Ford spray-booth	200
19	Bake	Ford oven	700
20	Repair poor welds	No. 75-PA Thomson spot-welder, auto control	60

During May, 1928, the nineteen contract air-mail routes in this country carried 199,284 lb. of mail, an increase of over 28,000 lb. over the previous month. The heaviest mail was from Chicago to San Francisco, totaling 56,654 lb., with New York to Chicago about 3,500 lb. less. Salt Lake to Los Angeles was next with 21,747 lb., and the Chicago, Kansas City and Dallas route was fourth, with 13,448 pounds.

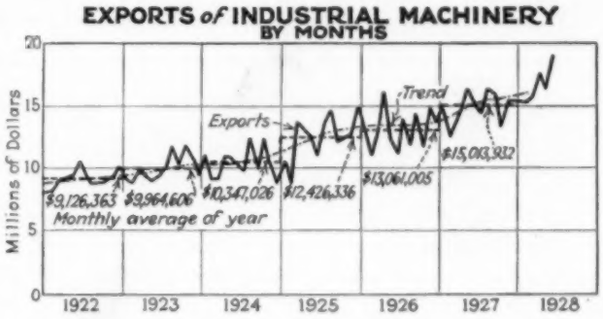
Activity in the Metal-Working Industry

Operations at a High Level

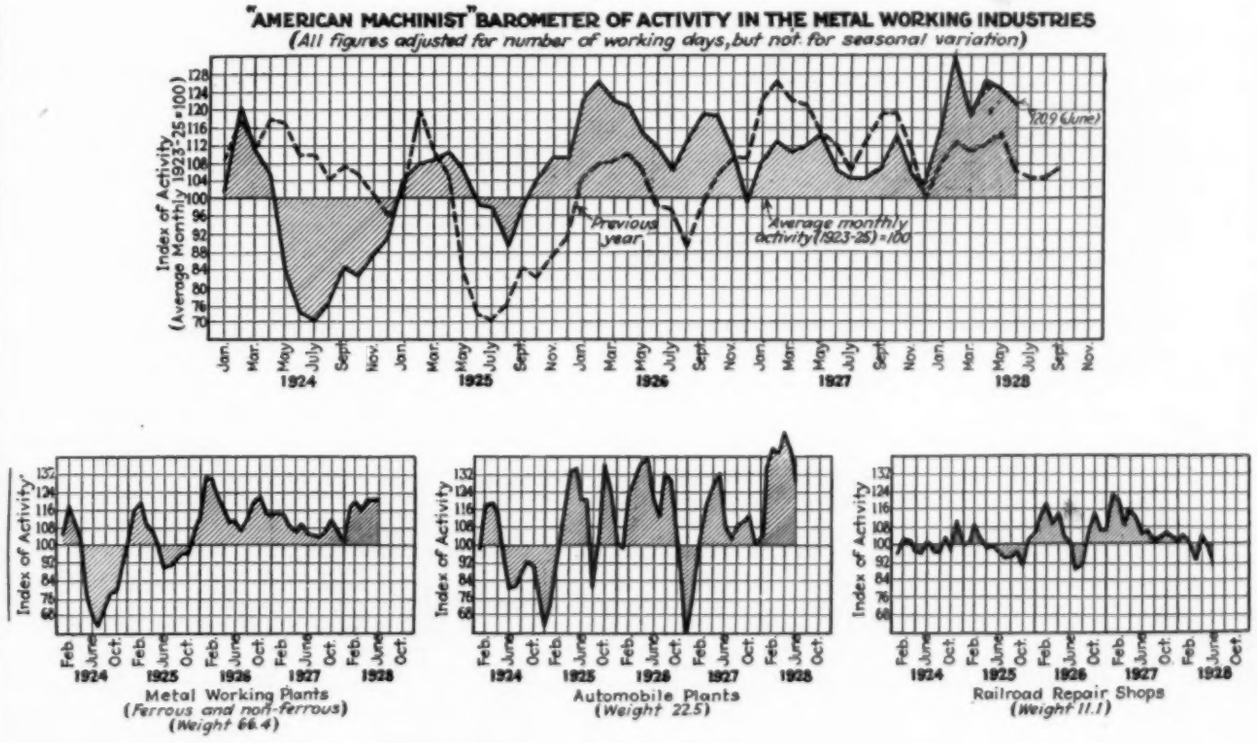
Preliminary data on the consumption of electrical energy indicate that the metal-working plants of the country were operating during June on a materially higher plane than during June of last year. The indications are that the large drop in rate of operations during June of last year did not take place during the month just closed. Preliminary figures last month indicated that there wes a large drop in operations in May, but the final figures showed that the index of operations was less than one per cent below that of April. The indications are, therefore, that the metal-working plants of the country are continuing on the high plane of operations which has been witnessed since the opening of the year. All indications point to a record summer in the industry.

The ferrous and non-ferrous metal-working plants reported May operations 12.5 per cent above those of last year and the preliminary figures indicate a rate of operations during June about 16 per cent higher than last year. The automobile manufacturing plants appear to be maintaining a high rate of operations, decreasing slightly under May, but materially over June of last year.

Exports of industrial machinery for the month of May reached a total of $19,000,000 as compared with $16,226,000 for April, according to data furnished by the Industrial Machinery Division of the Department of Commerce. This represented a gain of 25 per cent over May, 1927. Total shipments of machinery



for the first five months of 1928 are now more than 10 per cent in excess of shipments for the first five months of last year. The general upward trend of the past six years continues. Metal-working machinery is one of the classes showing persistent gains. For the first five months of 1928 this class has shown an increase of 34 per cent. The largest gain in the class for the five months' period has been made by lathes, which increased from $984,000 to $1,624,000; and by drilling machines, which increased from $298,000 to $488,000. Shipments of construction and conveying machinery made a gain of 53 per cent over May, 1927. Textile machinery showed a substantial increase, while paper and pulp mill machinery showed a decrease, declining from $1,996,000 to $1,505,000 for the five months' period in 1928. There was also a decline in ore-crushing and sorting machinery.



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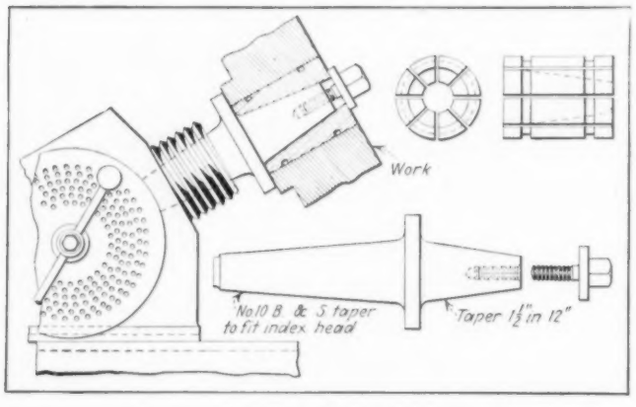
IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

An Expanding Work-Holding Arbor for the Milling Machine

By Phil. Simoneau

In the illustration is shown an expanding work-holding arbor for use in the dividing head of a milling machine. One end of the arbor is tapered to fit the hole in the dividing head and the other end is tapered for the expansion bushing. The bushing is split into eight pieces, as shown, the pieces being kept together by two rubber bands for which grooves have been provided near the ends.



An expanding arbor

The expansion is sufficient to take care of a variation of $\frac{1}{16}$ in. in diameter, and with a number of bushings of various outside diameters, a large range of work can be accommodated.

Mass Production in Gang Presses

By F. Heidinger

Mechanical Engineer, Western Electric Company

The aluminum drinking cup shown at *J*, Fig. 1, was made in eight operations, on a gang press equipped with a dial feed and eight dies. The shape of the cup after each consecutive forming operation is given in Fig. 1, while Fig. 2 shows a sectional view of top-and-bottom dies and a plan view of the lower dies and the feeding mechanism.

The blank has a diameter of $4\frac{7}{16}$ in. It is inserted into one of the holes in the dial and carried to point *A*, Fig. 2. There an ejector raises it to the surface of the dial and it is then ready to be transported laterally. The lateral feeding mechanism consists of two gripper bars *B* of rectangular cross-section, which slide on the plates *C*. The steel pieces *D* are screwed to the gripper bars and are cut out to suit the radius of the shell after each

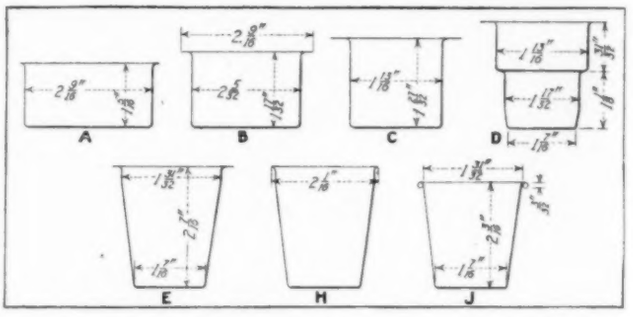


Fig. 1—Stages of the work after each forming operation

operation. They are connected to the members of the moving mechanism by means of the four brackets *E*. All movements are effected by cams. The action of the transporting mechanism is as follows: The fingers *H* hold the blank and the grippers each move in the direction indicated by arrows 1. When the blank is at *J*, they stop and then move in the direction of arrows 2, then 3 and then 4, thus returning to the original position, while the blank remains at *J*. In the meanwhile, the dial has turned and another blank is taken off by the grippers. The same cycle as described is then repeated, moving the first blank to the first die and the second blank to *J* and so forth. Each cycle corresponds to one stroke of the press. All movements are, of course, correctly timed and it may easily be seen that after nine strokes, all the dies are supplied with work and that with each succeeding stroke, one finished part is produced.

The pressure for the blankholders and strippers in the bottom dies is furnished by spring devices throughout. The ejector pins *K* in the top dies eject the work automatically at a certain point of the stroke. The holes for the ejectors are larger than their stems, to allow the air to escape through the tops of the dies. The punches have large air holes also, as they are absolutely necessary for good performance, especially for the feeding process. The shanks of the top dies are clamped in vertically-adjustable holders built into the press slide.

In the first die, the blank is drawn to the shape shown at *A*, Fig. 1, and the drawn shell is then raised to the level of the grippers by the stripper. The second die reduces the diameter of this shell but the outer diameter of the flange remains the same up to the fourth operation. As the grippers release the work, it slides over the blankholder *L*, Fig. 2, due to gravity. The outside diameter of the blankholder is slightly smaller than the inside of the work. A suitable radius at the flange of the shell as well as at the top of the blankholder centers the work. The third die is of the same construction as the second one, and reduces the diameter of the shell still more.

Only the lower portion of the shell is reduced in the fourth operation. When the grippers open, the work

stays on the stripper M until the stripper is forced down by the sleeve N of the top die. The inside diameter of the sleeve is greater than the outside diameter of the flange of the shell, and the tapered portion of the die centers the shell and thus prevents it from moving when sleeve N strikes the stripper. When the stripper descends, the work slides over the pressure pad O, and is acted upon as soon as the stripper has been forced down a distance equal to the height of the cup as shown at C, Fig. 1. Stripper M, and the pressure pad O, Fig. 2, then descend together, until the desired reduction is obtained. On the upstroke, the shell is lifted out by the stripper.

The fifth die forms the tapered portion of the cup and draws a cylindrical ring at the open end as a preparation for the curling operation. The flange is held between blankholder P and die S, and the shell is pulled over the punch T and pressed to shape. The ejector of the top die is backed by a tool steel insert W. The blankholder lifts the cup out of the lower die.

In the following two operations the flange is trimmed by twice cutting out two circular ring sectors. Trimming the whole flange in one operation would require special means, as for instance a scrap cutter, because a ring-shaped piece of scrap cannot be removed without interference with the grippers. While being trimmed, the work is centered and supported by member Z. The cup has now the shape as shown at H, Fig. 1.

In the last operation, the cup rests on member A^1, Fig. 2. The stripper B^1 is forced down below the edge of the curling ring C^1 by the die D^1. As the die descends farther, the cup is firmly clamped and the curl is formed by the curling ring. The groove of this ring is so designed that the outside diameter of the curled edge obtained is $\frac{1}{32}$ in. greater than the inside diameter of the stripper B^1. This feature makes it possible for the stripper to lift the cup out when moving upwards. The cup is then removed by the grippers and slides through a chute into a receptacle.

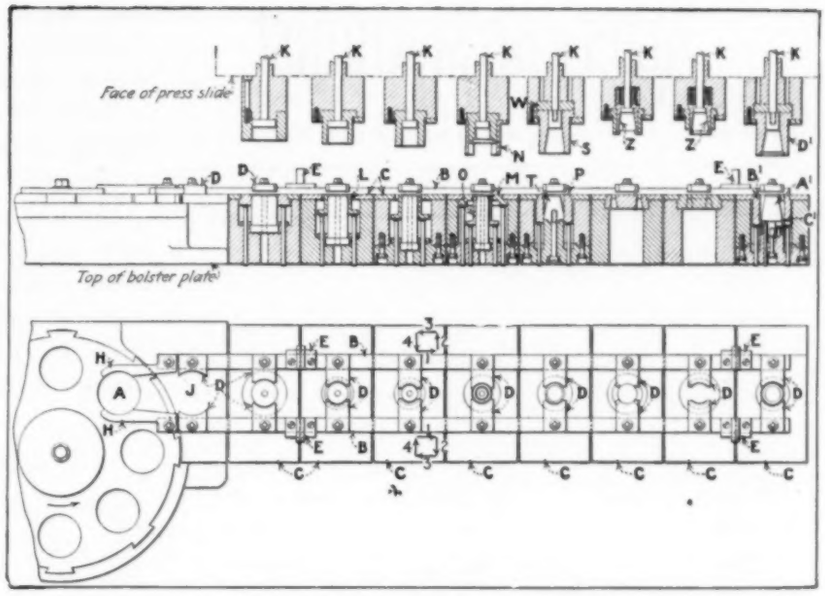


Fig. 2—Sectional and plan views of the dies

Making Drawings on Tracing Cloth—*Discussion*

By John D. Dyer

The article by J. E. Fenno under the title given above, published on page 786, Vol. 68, of the *American Machinist*, discloses one method of speeding up, but the method does not begin to approach the maximum speed-up demanded today. If the drawings as originally drawn are made in pencil tracing cloth, which is a very satisfactory modern product, they can then be blueprinted immediately without further hold-up for shop production.

Then if any particular parts are desired for standardization, or any parts of a drawing (say dimension figures) are particularly to be emphasized, or even if ink tracings are desirable for the whole job, it is a simple matter to ink directly over the pencil—if and when they are needed. Pencil tracing cloth will take the ink very satisfactorily.

The advantages are obvious—the information by way of blueprints, is gotten into the shop very much in advance; the draftsmen ink only that which is actually needed to be inked, and it is done without pressure when draftsmen are available, without holding up the shop.

Using Published Charts

By H. A. Smiley

Various periodicals frequently publish charts, tables, and curves that are of considerable value to some group of designers or production men. To make them available to a number of men in our organization, and at the same time to put them on our company forms, I have used the following plan:

Paste the original, or a photostatic positive or a photographic print of the desired chart, reduced or enlarged to the proper scale, on a sheet of the company's tracing cloth having a printed border. A photostatic negative is made and is signed through the engineering department, the same as any tracing, excepting that white ink is used. Any number of photostatic positives can be made from the negative.

The fact that the negative was built up, will not be apparent in the final job if the work is done neatly, and if good photostats are obtained. Acknowledgment of the source can be lettered on the border.

An Improvement in Triangles

By Morton Schwam

In inking-in drawings and tracings there is always more or less danger that the ink will run under the edge of the triangle or the T-square, so that when they are moved the work will be badly smeared. This danger can be eliminated by beveling all the edges of the triangle and the upper edge of the T-square at an angle of about 5 deg., reducing the thickness at the edges not more than $\frac{1}{32}$ inch.

The beveled edges of the triangle serve the same purpose as raising the ruling edge when inking the lines—a practice followed by many draftsmen.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Men Over Fifty

THERE is no denying that this is the age of young men. The automobile industry has been built largely by men young enough to be unhampered by tradition and this is even more the case in the development of aviation. But, unfortunately perhaps, though nevertheless true, men do reach the age of fifty with disconcerting regularity, and thereby increase the problems of management and of the efficiency engineer.

Periodically we are faced with the spectacle of attempted rejuvenation of old plants by men with varied and ingenious titles who try to evade being called efficiency engineers. In too many cases they begin with the idea that only young men can be efficient and that men over fifty must walk the plank or be retained at a reduced wage.

It is frequently true that a man who has passed fifty cannot keep pace with younger men in the production line. It is also true that such a man, due to his long experience, often proves very valuable in emergencies where the more vigorous but inexperienced man would be helpless. Then, too, there is the intangible thing called "morale" to be considered. It is a bit difficult to demand loyalty of men while turning old employees adrift after long terms of service.

We heartily disapprove of the custom of some savage tribes of drowning or otherwise disposing of those who are too old to be longer efficient. But it is not easy to see that a civilization which turns men adrift to find an existence as best they may, has advanced as far as we like to think.

Every foreman would like a crew of unusually skilled men. But he must deal with averages instead of 100 per-centers. No industry, according to one large manufacturer, should expect to pick the cream of a community, but must utilize the average to the best advantage. If all managers and industrial engineers would recognize this principle, there would be more loyalty and probably a greater average production.

Gen. Smedley Butler, in command of the Marines in China, is reported to have said that it is easier to fight than to avoid it, but that they would only achieve complete success if they did their work and left China without bloodshed. Industrial engineers may well adopt the same creed. It is easy to make a temporary showing by firing some men and by reducing wages. But lasting success comes only when the organization is disturbed as little as possible.

It takes a bigger man to get the best results with men as he finds them, perhaps by installing better machine equipment, but it makes for bigger and better returns to stockholders in the long run. The man of fifty cannot be discarded without detriment to the community as a whole.

Reducing the Costs of Distribution

RECOGNITION that the selling end of business needs careful attention is a hopeful sign. The recent address of President Graham, of the Bolt, Nut and Rivet Manufacturers' Association, pointed out a condition that has its counterpart in other industries. Mr. Graham stated that in 1924, with a gross business of approximately $75,000,000, the industry lost $12,000,000. One company in April of that year, with a payroll of $47,000, showed a net loss of $51,000—a loss of $4,000 if the men had worked without pay.

Mr. Graham's company took the bull by the horns, advanced prices 35 per cent and announced that no more business would be taken at a loss, with the result that many customers promptly evinced a willingness to pay a fair price. A study of production costs was then made and prices set to earn a fair return on each unit of equipment.

Distribution costs, however, still were a problem. Investigation showed that manufacturers were competing with distributors, with the result that neither were satisfied. A plan to better this condition was devised. Instead of giving exclusive territory to distributors, as is done in some lines, the manufacturers retain the privilege of soliciting the largest customers and of selling direct to such as voluntarily send orders direct to them. They do not solicit business from small customers in any district, believing that it is the distributor's function to handle such accounts. The plan, in other words, is a combination of direct selling and of agencies, or jobbers, with no stipulations as to resale prices.

It is doubtful if this exact arrangement would work satisfactorily in all lines. But for small products such as bolts, nuts, rivets, and probably many others, it evidently has many good points. It is at any rate a recognition that not all problems rest with production, and that of itself is a hopeful sign.

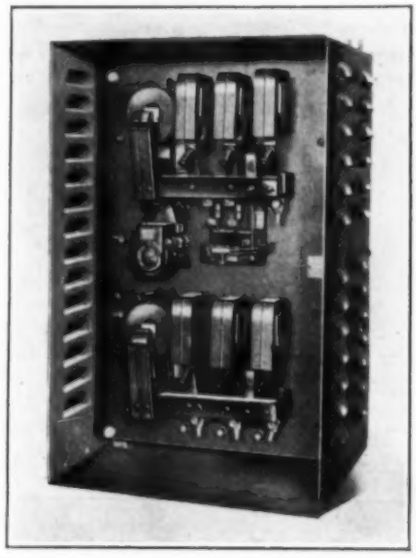
· SHOP · EQUIPMENT · NEWS ·

Lewis No. 7-C Automatic Rotary Wire Straightening and Cutting Machine

TWO sizes of this wire straightening and cutting machine have been placed on the market by the Lewis Machine Company, Cleveland, Ohio. Wire up to $\frac{3}{16}$ and $\frac{1}{4}$ in. in diam. are handled by the two sizes, respectively. The smallest size wire that can be handled is $\frac{1}{16}$ in. The straightener arbor, main drive shaft and flywheel are mounted on Timken tapered roller bearings.

The straightener arbor consists of five sets of dies which may be either iron or bronze, depending on the finish desired. The clutch is similar in construction to that used upon a punch press. The operating parts have been reduced to a minimum and consist only of a trip lever and clutch dog which drives the flywheel shaft. This shaft revolves only when the wire is being cut off. It is mounted on bronze bushings in the bed. A cam on the flywheel shaft operates the cutter bar. The feed rolls are geared directly to the flywheel, the lower feed-roll shaft running in bronze bushings in the housing, the upper running in a long sleeve which takes the pressure from the adjusting screw. An automatic release lever, operated directly from the cut-off shaft, releases the pressure from the feed rolls when the wire is being cut off. This prevents slipping of the feed rolls on the wire during the cut-off operation, avoids marking of the wire and increases the life of the rolls.

Both sizes are driven through a double Texrope drive. The motor is mounted on a bracket which is bolted directly to the machine leg, and has $1\frac{1}{2}$-hp. capacity and runs at 1,800 r.p.m. The over-all height of the machine is 44 in., and the floor space required, not including the reel, is $16\frac{1}{2}$ x 36 in. long for the 2 ft. machine, and $16\frac{1}{2}$x48 in. for the 3-ft. machine. The weight of the larger machine is 775 pounds.

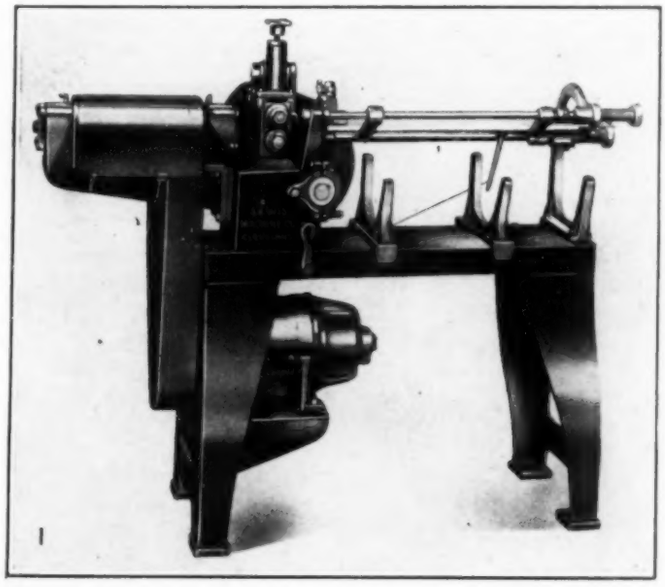


Westinghouse Thermal Overload Relay

Westinghouse Thermal Overload Relay

This thermal overload device, which retains calibration and automatically permits the safe overload capacity of the motor to be fully utilized, has been placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The device follows the heating curve of the motor, which means that the motor will not shut down instantly in case of high, but harmless over-current demands. As shown in the illustration, the unit is small and completely inclosed.

Motor temperature depends on the length of time the current flows, as well as the amount of current. If either factor is small, the other can safely increase and the machine will have the same temperature, so that short high shots of current can be absorbed readily. Continued high current, however, will soon saturate the metal with heat. The operating characteristic of this device follows the heating curve of the motor and



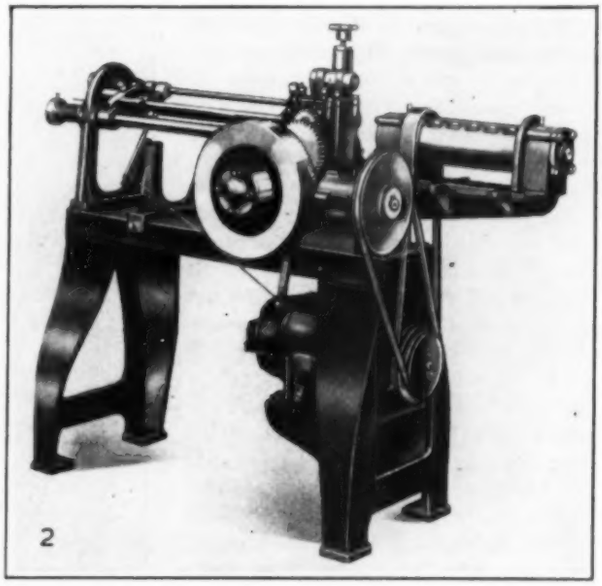
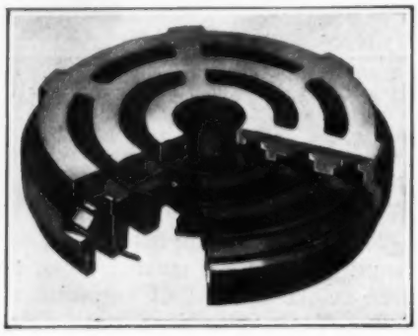


Fig. 1—Front view of the Lewis No. 7-C Automatic Rotary Wire Straightening and Cutting Machine
Fig. 2—Rear view of the machine

automatically delays its action inversely as the current flowing. The higher the overload, the shorter the time in which it will operate. The relay is easily adjusted for plus or minus 20 per cent of normal rating by moving a small lever.

Pennsylvania Improved Air-Cushioned Valve for Compressors

Simplicity of construction marks the improved air-cushioned valve for compressors which has been introduced by the Pennsylvania Pump and Compressor Company, Easton, Pa. The guard and seat are secured together by retaining rings instead of by screws. This change has made possible a valve which is interchangeable in both the inlet and discharge assemblies, and has permitted larger port areas.



Pennsylvania Improved Air-Cushioned Compressor Valve

The valve consists of four principal parts: seat, guard, disks and springs. The seat is made from a casting of close grained structure, while the special malleable metal used in the guard resists breakage and wear. Tough, tempered spring steel is used for the valve disks which are ground flat. The valve disks are guided by a number of columns on the guard which support the valve above the seat, the movement of the disks being accelerated by small spiral springs. The valve assembly is held together by means of a retaining ring which engages the valve guard and seat. This ring fits in a recess around the inside of the flange of the valve guard and normally remains in this position. When the seat and guard are brought together, this retaining ring snaps into a corresponding groove around the edge of the valve seat. The valve assembly is held firmly to its seat in the cylinder by the clamp which is brought up tight against the assembly by means of the valve cover set screw. When the set screw is drawn down, it brings the pressure of the yoke on the outside rim of the seat or guard against the cylinder seat and cannot, therefore, exert pressure in the center of the valve seat, which might cause bending thereof.

Movement of the valve is smooth and quick, quietness of action being obtained by the use of an air-cushion pocket in the guard. As the valve opens, the disks enter this pocket and the trapped air provides a cushion, which prevents the valve from striking the guard. Provision has been made for large air ports which permit the passage of a maximum volume of air with the least resistance, thus increasing the operating efficiency of the compressor. An additional air passage is provided by a central opening through the guard.

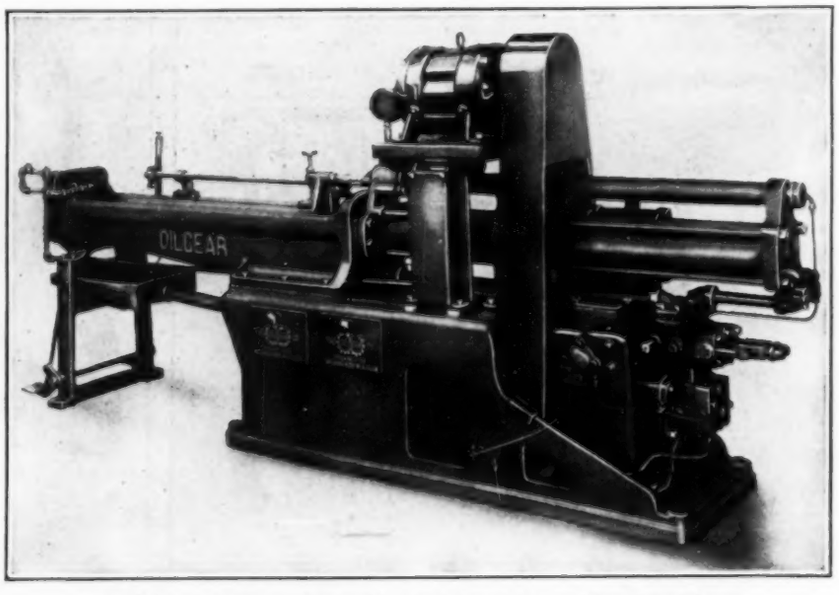
Oilgear Improved No. 3 High-Speed Broaching Machine

SIMPLIFIED piping, among other improvements, has been incorporated in the No. 3 high-speed broaching machine manufactured by the Oilgear Company, Milwaukee, Wis. Rearrangement of the piping below the cylinder has improved the appearance of the machine while making it more compact. The safety and relief valves have been manifolded onto the pump, which has been improved as described elsewhere in this issue. The No. 3 machine is shown in the illustration, and was described on page 172, vol. 63, of the *American Machinist*. A control guard is provided to safeguard the operator. Sea ring ram packing is used as standard.

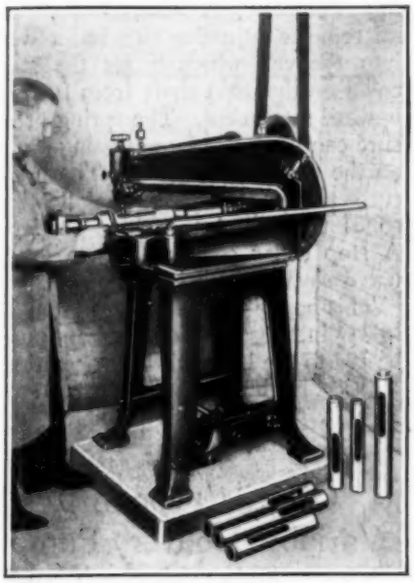
The crosshead is equipped with a convenient adjustment for raising and lowering the drawhead slide to accommodate different pull center lines. This feature is useful when broaching keyways where it is necessary to take two draws with the cutter bar and then raise the center line of the draw bar in order to obtain the proper depth of keyway.

Campbell Special Model 1-B Nibbling Machine

Tubes used in the manufacture of oil burners may be slotted by this specially adapted No. 1-B Nibbling Machine which has been announced by Andrew C. Campbell, Inc., Bridgeport, Conn. This machine has a special head with outboard bracket in front and a block in the throat of the machine, giving an effective throat



Oilgear Improved No. 3 High-Speed Broaching Machine



Campbell Special Model 1-B Nibbling Machine

depth of 16 in. for the pieces shown.

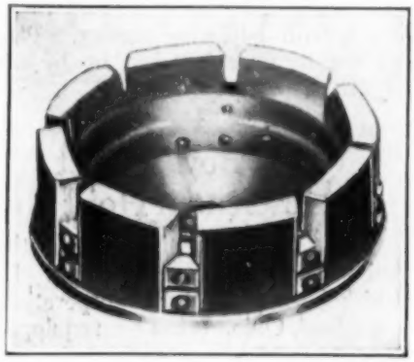
According to time studies made after this machine was installed, the operating time necessary for cutting holes in the sides of tubes was reduced from 16 min. to 40 sec. A number of the finished tubes are shown in the illustration.

A mandrel that closely fits the inside diameter of the tubing being cut is used. The template is made up of two half-tubes hinged with a quick-acting clamp so that the device can be readily attached to the tube being cut. The outboard bracket has a quick-acting swing clamp to hold the outboard support for the mandrel, thus enabling the tubes to be put on and removed with ease and rapidity.

Rogers Segmental Knife Grinding Chucks

To facilitate fast and cooler grinding of knives, this segmental grinding wheel chuck has been introduced by Samuel C. Rogers & Company, Buffalo, New York. This chuck, which is simple in design, is used on one of the knife grinders made by the above company and may also be applied to the face and surface grinders of other makes. It is regularly made in five standard sizes, 12, 14, 16, 18 and 22 inches.

The 14-in. size has eight segments 4x4x1¼ in., mounted in a strong, machined chuck with simple adjustable parts for securely holding the segments. These parts consist of the inner ring of the chuck and two sets of clamping wedges. When the segments are worn half way down, the outer wedges and inner ring are removed and the use of the wheel continued until the segments are completely used up. The wheel is protected with a suitable guard adjustable to conform with the wearing of the segments. The weight of the chuck is 60 pounds.



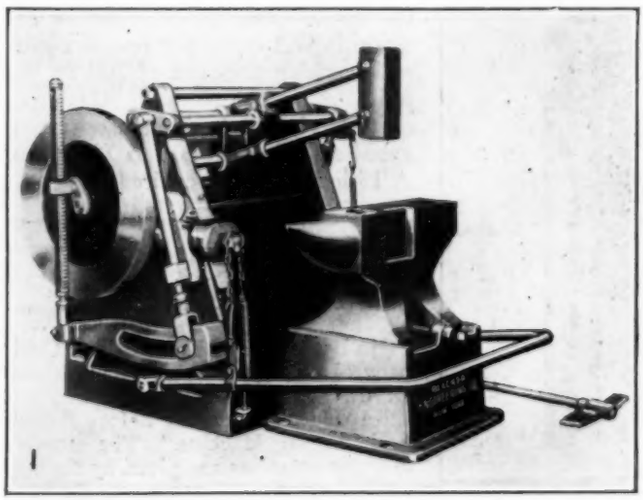
Rogers 14-Inch Segmental Knife Grinding Chuck

Blacker Model B Blacksmith Hammer

AN IMPROVED model B blacksmith hammer, designed for general utility and jobbing blacksmithing work has been placed on the market by the Blacker Engineering Company, Grand Central Terminal, New York, N. Y. Although retaining all the features common to earlier designs, it is a larger and heavier machine throughout. Thrust bearings have been fitted to the control mechanism and a complete rearrangement of the motor drive has resulted in the compact unit shown.

This power-operated hammer will strike 140 blows a minute which are several times as heavy as hand sledge blows. It works upon an ordinary 500-lb. anvil and the usual hand forging tools are used. A link motion permits positive control of the blows, and the head may be traversed along the anvil face.

The force of the blow is regulated by the treadle which extends around the anvil base. A winged foot lever controls the gears which cause the head to traverse. Double shouldering operations are performed on the central "cut-out" placed in front of



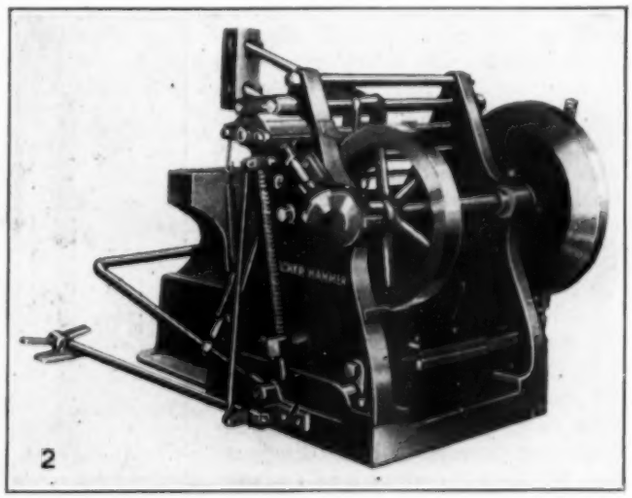


Fig. 1—Front view of the Blacker Model B Blacksmith Hammer. Fig. 2—Rear view of the Blacker Hammer

the anvil. The anvil is fitted to its block with adjusting screws. Play of the hammer is taken up by the flywheel springs.

"Blue Boy" Direct Differential Hoist

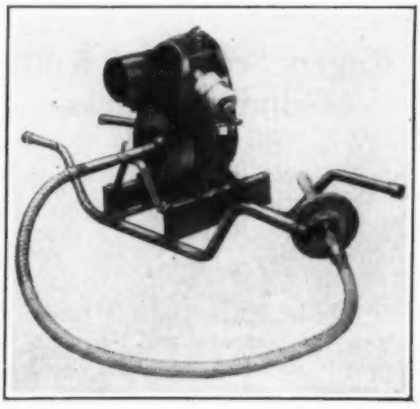
This "Blue Boy" direct differential hoist is being manufactured by Chisholm-Moore Hoist Corporation, Cleveland, Ohio. It has been equipped

"Blue Boy" Direct Differential Hoist

with a Hercules Inswell electric-welded load chain which gives it a high degree of safety. The chain has been copper plated and the load sheaves are extra-heavy. Malleable iron yokes are used and a drop-forged hook is a feature.

Stow Gasoline-Driven Unit

Grinding, drilling, filing and sanding may be done on isolated railroad jobs and in remote shops by means of the gasoline-driven unit which has been developed by the Stow Manufacturing Company, Inc., Binghamton, N. Y. This portable unit, shown in the accompanying illustration, has



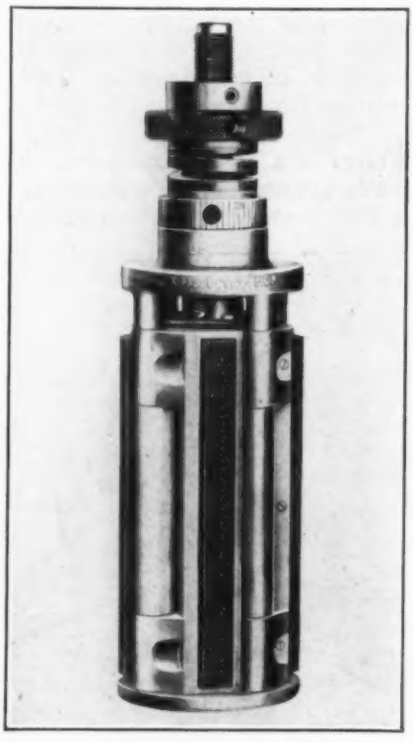
Stow Gasoline-Driven Unit

a capacity of 2.2 hp., and has the speed adjustable from 1,400 to 2,200 r.p.m. It will be noted in the cut that the unit is supported on channel cross members carried on bars conveniently bent so that two men can carry the equipment. A No. 5 flexible shaft 10 ft. in length and having a metal case is provided. This shaft will carry an 8x1-in. wheel.

Hall Model X Production Hone

This production hone is of the spring-pressure positive-limit type. It is made by the Hall Manufacturing Company, Toledo, Ohio. A micrometer adjusting ring is screwed into the cap which limits the stop collar on the main shaft from further upward movement. The spring pressure can be varied by adjusting a nut on the top of the shaft. The pressure produced causes two floating cones to expand the stone carriers. A stop collar contacts with a graduated sleeve which is set to size.

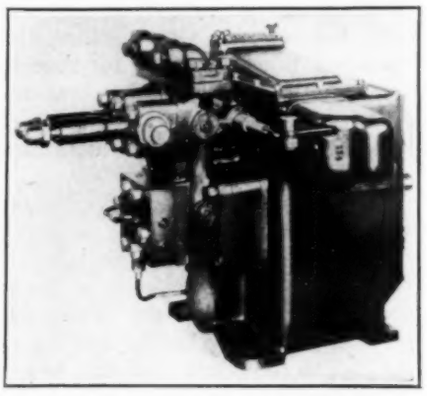
This hone is made in sizes from $2\frac{1}{4}$ to $3\frac{1}{8}$ in. A stream of lubricant must be fed to the hone when in operation. Vertical honing at a speed of 220 surface ft. per minute is possible.



Hall Model X Production Hone

Oilgear Type MD Variable-Delivery Pump

This improved type MD pump manufactured by the Oilgear Company, Milwaukee, Wis., is incorporated in the No. 3 high-speed broaching machine described elsewhere in this issue. The displacement of this pump is 17.1 cu.in. per rev. at a normal working pressure of 700 lb. per sq.in. A peak pressure of 900 lb. per sq.in. can be obtained. The operating speed ranges from 600 to 730 r.p.m. A 15-hp. motor is required.



Oilgear Type MD Variable-Delivery Pump

Trade Catalogs

JIG BORERS. The R. Y. Ferner Company, Investment Bldg., Washington, D. C., has published a pamphlet entitled "Questions to Ask Before Buying a Jig Boring Machine." The answers to these questions are given by the Société Genevoise d'Instruments de Physique of Geneva, the builder.

NEWS OF THE WEEK

France Now in Adjustment Period After Franc Stabilization

Increase of foreign competition feared

BY OUR PARIS CORRESPONDENT

NOW that legal stabilization of the franc is *de jure* as well as in fact at virtually 25 francs, 50 centimes, to the dollar, it remains to be seen what its effect will be on interior and foreign trade relations. The former is not likely to break immediately into a rapid pace and it is doubtful if the latter will show any great improvement for some time to come as, more than ever, it will have to meet stiff and growing competition. Belgium's stabilization at even a lower rate for its national currency brought the living cost index on a gold basis down to 121, against 128 in France for some time past, a rate far below that of Anglo-Saxon countries, but much better than that in Germany or Italy.

The franc henceforth is practically free from speculative influences, and any fluctuations likely to supervene will be brought about as the result of trade balances and the incomings and outgoings of gold. Care and precision will be required in placing foreign contracts for raw or other materials, and sales abroad will be subject to very definate price factors, though uncertainties that might otherwise last over a comparatively long period will have been practically eliminated.

FOREIGN COMPETITION

The metallurgical and metal transforming and fabricating trades will be no exception to the above. There will be an influx of foreign metal manufactures into France and French manufacturers will be forced to adopt keen methods both as to production and distribution in order to hold, and increase if possible, the headway that France has made abroad in these lines during the past few years.

The solving of certain handicapping fiscal and taxation problems are looked to relieve industry of some of the heavy charges as a result of franc stabilization. Taxes in general on industry and trade have reached a point where they form no inconsiderable part of sales prices of high-priced units in all metal lines. Relief from this complex and heterogenous overcharge will do more than anything else to stimulate trade. The new Legislature, meeting again in the autumn, is expected to take steps to bring about this needed change.

Prof. Edgard Ailix, of the Law Faculty of the University of Paris, has shown that taxing at the source by no means relieves the consumer in the long run. He cites a metal product which costs 100 francs, which with the turnover tax added stands at 102 francs. The wholesaler adds his profit and sells the article for 132.60 francs. To this is added the turnover tax again and the figure rises to 135.25 francs. The retailer sells the article for 175.81 francs plus his turnover tax of 3.51 francs, a total of 179.32 francs. And all this, supposing the article is some unit of utility such as a household machine or a small machine tool. In other words there are taxes on turnover alone amounting to 8.16 francs to the hundred. The charge is a heavy one whatever may be the merits of a tax at the source or a tax on consumption.

UNEMPLOYMENT GROWS

From official figures of mid-June a crisis in labor appears to be brewing as shown by unemployment on a growing scale in many lines and in widely distributed industrial districts. Meantime seasonable immigration of agricultural laborers is taking place, those coming in from Belgium reaching 80 per cent of the total of 5,000 or more a week.

Though the claim is modest, the metal trades profess to show a satisfactory activity in mid-France, less so in the lower Loire, holding their own in the east of France and eminently satisfactory—though this is believed to be but momentarily — in the Paris district. Tendencies indicate the possibility of a slowing down all along the line during the readjustment period resulting from franc stabilization.

Frankly the shipbuilding industry is in a crisis, though orders have not been wanting in a small way. One important yard was shut down and the famous Penhoet works at Saint Nazaire, probably the best equipped in machinery and facilities in all France, showed a profit for the last year's operations of but 116,556 francs, rather less than five thousand dollars.

Automobile accessory and parts makers, through their spokesman, Maurice Goudard, are still loud-pedalling for standardization to the extreme limit as a means to efficient manufacture and distribution. Considerable progress has been made as has been referred to before. It is now claimed that the automobiles still running on the road in France necessitate the stocking of 1,800 models of valves, requiring a constant stock of 400,000 pieces. Standardization projects under way should at some time in the not very remote future reduce these to 100 models requiring a stock of but 20,000 units. Of batteries, the 120 current models of a few months ago have already been reduced to 7 units.

The swing of the pendulum on pleasure and commercial motor vehicles shows that French exports have fallen greatly in the first three months of the present year—20,807 metric tons as compared with 26,179 in 1927. Imports, on the other hand have increased from 742 to 3,202 tons. The change in position is important. Dynamos and transformers, however, were exported to the extent of 2,483 tons in the period in 1928, showing an increase of 50 per cent over exports of last year.

Malleable castings and finished parts for transmission machinery have shown a remarkable export gain during the last three years, with imports today standing at practically 20 per cent of the total export tonnage, And the French learned the art from the malleable founders of the United States, at that.

RAILWAY RECEIPTS INCREASE

Railway receipts have shown a steady increase amounting to 20 per cent since the first of the year, but car loadings as a whole averaged but an 8 per cent increase for the first twenty odd weeks of the year, some weeks showing a lamentable falling off from the figures in 1926 and an appreciable drop from last year.

Makers of farm machinery have raised prices 20 per cent on replacement parts, which the industry itself considers moderate considering that the former *prix courant* dated from March, 1927. The tariff *additif* which was recently incorporated into the French tariff however did concede something on the import of required parts for machinery originally bought abroad, and this the French industry has protested against, though at the same time it has sought to equalize prices in the interests of home profits. Naturally the distributors and consumers of such articles protest.

The machine wire industry is still benefitting from the growth of exports, which for the first three months amounted to 85,000 tons as against 66,000 last year. Prices on wire and wire nails have increased 10 per cent. Chains, both welded and forged, have undergone a recent rise of 10 per cent.

Steel founders working for the auto-

mobile and machinery trades find business seasonably normal, but with little prospect of improvement in the respective compartments cited. If anything, prices here also show a tendency to rise.

The nut and bolt industries show slight improvement in demand but bargaining negotiations are apparent between producers and jobbers.

Machine tool manufacturers still suffer from the competition of bigger firms to a slight extent and are even more handicapped than the latter by the high wage scale and their inability to handle the labor turnover in dull times to the same advantage.

Wide opinion shows that capacity production of French machinery and tool producing plants is in excess of the current demand for output and wonders that so many of the small fry are able to continue to exist, claiming that they might better qualify as contributors to a vertical scheme of rationalizing of the industry rather than hoping for inclusion in the horizontal plane or even playing their lone hands.

Hoisting, loading and unloading machinery seems to be due for further progression, if not actually a boom, above all with respect to heavy units for railway and shipping services. France has hitherto hung mysteriously behind other progessive countries in this respect, but has learned much since the war and is likely to go still further, particularly where electric power can be employed.

The Paris Industrial Fair, just closed, met with much more recognition than any previously held. Visitors exceeded two million. There were 614 exhibitors, of which the United States accounted for 64; Germany, 85; Italy, 91, and Great Britain, 38.

High Living Costs

High living costs still form the principal object of discussion among consumers, but it is coming to be understood that the price ticket alone is not the sole indication of the scale. More and more it is admitted that the purchasing-power factor plays its part. The laborer at 18 to 20 francs a day, a rise from 8 francs before the war, can not very well carry the load of the coefficient of 5 for the cost of his daily needs, and the 30-franc worker in an automobile plant is actually back on the 6 franc a day gold scale and 50 per cent under what he really requires to improve his standard of living, even a trifle. Industry itself claims to have reached the limit of the wage scale and still turn out its product at prices that will compel the consumer to buy. Here again the question of fiscal charges is seen to be a big factor.

Four months imports from the United States show a drop of 500,000,000 francs as compared with last year. The drop for Great Britain is 300,000,000 francs and for Germany 110,000,000 francs. Exports fell to the United States and to Great Britain, but increased to Germany. Total exports showed a drop of a billion francs, but imports about balanced. The trade balance is thus heavily against France.

The French protectorate of Morocco is still developing as an outlet for light machinery, tools, boilers, tubes and metal transformations for building and construction needs. France and Belgium are the principal suppliers.

The State debt to the Bank of France has been reduced from 21,300,000,000 francs to 18,000,000,000 francs and bank note circulation has likewise dwindled 667,000,000 francs during the past month. This, of course is encouraging to the optimists who believe that stabilization of the franc is to save the situation.

Industrial Leaders to Discuss Human Relations

Between six and seven hundred industrial leaders are expected to attend the eleventh annual conference on Human Relations in Industry, sponsored by the industrial department of the National Council of Young Men's Christian Associations, to be held at Silver Bay on Lake George, N. Y., August 29 to September 2. There will be seven sectional conferences on: Personal problems and work efficiency; economic incentives; the scientific approach to industrial relations; railroad conference; the foreman as a personnel developer; pensions and retirement plans; and personal service to operating departments.

Preceding the conference will be two courses on industrial leadership beginning August 21. Course 1 is intended primarily for first-year men at Silver Bay and for foremen, and will be conducted by A. L. Mann, supervisor, industrial education, New York State Department of Education. Course 2 is primarily for executives and will be conducted by H. N. Clarke, counsel on industrial morale, of Cleveland. He will outline the laws that control and motivate men and indicate management's responsibility for better use of human material.

Further details concerning the conference and courses may be obtained from the executive secretary, Fred H. Rindge, Jr., 347 Madison Ave., New York City.

Increase in Profits in the Motor Industry

The 1928 trend of profits in the motor industry, exclusive of Ford, so far as disclosed by the statements of the first quarter, indicates a decided improvement for the industry as a whole. While for the entire year 1927 the profits of the motor industry increased 6 per cent over 1926, this increase was far more than accounted for by the improvement in the profit position of the General Motors Corporation. The other companies in the aggregate suffered a decline of 20 per cent for the entire period of 1927 as compared with 1926.

Recent figures, however, very definitely indicate an improvement for the industry as a whole. For the first quarter of 1928, General Motors reports net profits of about 69 millions as compared with 52 millions for the corresponding period of last year, an increase of 32 per cent. The improvement in the aggregate of the other companies is also marked. The combined net income of 17 motor vehicle manufacturers exclusive of General Motors shows an increase of 20 per cent in the first quarter of 1928 over the corresponding period for 1927.

The recovery in the earnings of the motor equipment companies that has occurred, in line with the expansion of activity in the motor industry, is also noticeable. The year 1927 was one of declining profits for the industry as a whole, the net income reported by 21 companies showing an aggregate decline of 23 per cent as compared with 1926.

On the other hand, the net income reported by eighteen companies for the first quarter of 1928 shows an increase of 8 per cent over the first quarter of 1927. Only four of the eighteen companies reporting showed earnings less than those of the first quarter of 1927. The other companies reported gains ranging from 5 to over 100 per cent.

Committee on Calendar Simplification Formed

Practical steps toward ascertaining public opinion in America on the subject of revising the calendar are to be taken at once through a nation-wide inquiry, according to George Eastman, chairman of the National Committee on Calendar Simplification for the United States. The formation of this committee is the result of an invitation from the secretary-general of the League of Nations asking the United States, in common with other nations, to form a national committee to investigate and report the prevailing sentiment with respect to calendar simplification.

When the national committees of the different countries have reached their conclusions, an international conference will be called similar to the Washington convention called by President Arthur in 1884 to establish Standard Time. The agreement on calendar revision at the international conference will take the form of a treaty.

In addition to the National Committee for the United States, the National Academy of Sciences has appointed a special committee on calendar. The Chamber of Commerce of the United States, the American Bar Association and other important organizations have taken similar action.

The simplified calendar of thirteen equal months has been endorsed by the National Association of Cost Accountants, the Canadian Government Advisory and Technical Commission, by such labor organizations as the International Association of Machinists and the Brotherhood of Railroad and Steamship Clerks. The strength of the demand for calendar revision as a business necessity is indicated in the fact that numerous concerns have long utilized a 13-periods-to-the-year system in their accountings.

Shop Equipment Exhibits at Automobile Shows Planned

Automotive shop equipment sections and clinics are planned for thirteen cities, the majority of them in connection with the regular 1929 automobile shows. This was decided upon at an informal discussion of the subject participated in by several prominent shop equipment manufacturers who met at Mackinac Island in late June.

The cities in which the manufacturers hope to conduct working exhibits similar to those in the national and some of the sectional automobile shows in 1928 are as follows: Dallas, Kansas City, St. Louis, Pittsburgh, Philadelphia, Los Angeles, San Francisco, Detroit, Baltimore, Cleveland, Minneapolis, Atlanta, and Montreal. In addition to these, there will be the shop equipment exhibits at New York, Chicago and Boston open to the trade only.

Some Notes on the Swiss Machinery and Tool Trade

The Basle Swiss National Trade Fair just closed was of considerable importance. Swiss participation increased 50 per cent over that of last year and foreign exhibitors, largely of Central Europe, made a good showing. The machine tool section was fully represented, including many precision tools. The Secheron Works, of Geneva, showed a display of electric welding and riveting tools and applicances. There were also shown many special machines adapted to the needs of the textile industries and the application of electricity thereto for motive power.

The Swiss metallurgical, machinery and tool trades give employment to 223,934 workers, of which 36,737 are women and girls. The greater number of workers are between 20 and 30 years of age, but there are 5,667 over 60 years. Of these, 587 are directors or managers of enterprises and 2,009 technical engineers.

Of these separate enterprises 200 are stock companies employing a capital of 199,206,000 francs. This represents 2 per cent of all stock companies in Switzerland and 3 per cent of the total capital employed in such.

Wages in the Swiss machinery industry are scheduled as follows, the Swiss franc being at par.

	Wage per Day	
	1914	1925
Foremen	8.55 fr.	16.20 fr.
Specialist workers ..	6.36 "	12.43 "
Non-specialist " ..	4.88 "	9.79 "

In the metallurgical, machinery, tool and watch trades there are 42,709 trade unionists, a larger number than in any other Swiss industry.

"Real" Earnings on the Increase

Figures furnished by the National Industrial Conference Board show that "real" earnings of industrial workers increased in the first quarter of 1928. The figures show the relative cost of living, money wages, and real wages compared to conditions existing in July, 1914. The figures were compiled monthly.

The curve for hourly earnings shows very little fluctuation and is gradually rising, the average hourly earning for the first two months of 1928 being only one-tenth of one cent higher than for the same period of 1927. The money weekly earnings curve, however, shows considerable fluctuation and does not parallel the hourly earnings curve. The money weekly earnings for the first few months of 1928 are actually nine cents below the weekly earnings for the same period of 1927. The lack of parallelism between the two curves is partly accounted for by the fact that there is a variation in the number of hours actually worked each week. This also accounts for the apparent decrease in weekly earnings for 1928 as compared with last year.

While in wages there has been a very slight upward trend in recent months, in the cost of living the contrary has been the case. In the first quarter of 1927 the cost of living relative to conditions during 1914 stood at a level of 165.4, and in the first quarter of 1928 at a level of 162.9. All of the major items that enter into the cost of living decreased from 1927 to 1928. The greatest decrease occurred in rent, which dropped about 4 per cent. This subsidence in the cost of living, combined with approximately stationary earnings, has brought about an appreciable upward movement of real earnings, which is very apparent from the curves of real hourly earnings and real weekly earnings.

The record for the year so far shows that the wage earner in manufacturing industries is holding his own, and possibly in a slight degree has improved his position. It would also seem that the unemployment condition that existed in the latter part of 1927 was magnified, as it has not betrayed itself in a lowering of wages.

Automotive Trade Associations Merger Progressing

The proposed merging of the Automotive Equipment Association and the Motor and Accessory Manufacturers Association, has met with the unanimous approval of the members of the former at their recent convention at Mackinac, and the approval of the directors of the latter organization. Joint committees from the associations will meet in Chicago, July 17 and 18, to discuss further details of the plan. Economic forces have been drawing the two groups together for a number of years. The project came prominently to the front in the summer of 1925, and the satisfactory completion of the present merger is predicted by many men in the industry. The activities of the two associations are fundamentally similar.

Chrysler Opens Engineering Building

On July 2 the Chrysler Corporation celebrated the opening of its new engineering building at the Highland Park plant, Detroit, Mich. The new unit houses complete facilities and equipment for carrying on the many phases of engineering research and development work, including fully-equipped mechanical, electrical, metallurgical and chemical laboratories. The building represents a complete factory within itself, enabling the engineering division to create, design and build original and experimental cars. An advance showing of a new line of cars marked the opening of the building.

Swiss Imports in 1927 of Machine Tools for Working Wood, Stone and Metal

Country of Origin	Quintals (100 kilos)	Value, Swiss francs
United States	1,728	949,610
Germany	34,879	7,693,009
France	2,481	579,193
Belgium	1,172	250,934
Total 1927	41,148	9,854,916
Total 1926	34,505	8,272,065
Machine Parts		
United States	2,234	1,612,573
Sweden	1,338	1,952,384
Germany	43,706	11,673,391
France	8,647	2,211,022
Belgium	2,358	1,216,170
Great Britain	1,434	1,246,576
Total 1927	63,052	20,557,722
Total 1926	52,029	15,813,747

Totals include all countries even those omitted specifically.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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ON JULY 2nd call money loaned at 10 per cent on the New York Stock Exchange. It went back to 5 per cent at the close of business July 3, but the advance attracted more attention than the decline and it has led everyone to ask whether we are entering upon a period in which credit will be scarcer and loans more carefully scrutinized than formerly. It is generally realized that in such a period liquidation and contraction would be compulsory and that a gradual decline in both security and commodity prices would be the result.

But it is also generally, though mistakenly, believed that the Federal Reserve Banks have the power to make credit cheap or dear and that their existence is a guarantee against what used to be called money panics. The prevailing idea is that a member bank whose customers need accommodation can get what it is willing to lend them upon application to its Federal Reserve Bank, and that the supply of credit thus made available is practically inexhaustible.

Bankers understand that this is not so, but seven out of eight business men interrogated last week were plainly under the impression that the Federal Reserve Banks would rediscount loans made by member banks against negotiable stocks and bonds. Two of the men thus interrogated were stock brokers who certainly should have known better, and as this widespread misbelief may have serious consequences it is in order to point out that commercial paper, bankers' acceptances and loans made against U. S. bonds are the only obligations that are eligible for rediscount at the Federal Reserve Banks.

As a result of this limitation loans made against other than government securities represent a reduction in the resources of the lending banks, and their ability to continue lending becomes practically dependent upon the amount of commercial paper that they hold and are willing to rediscount. Last week the total of member borrowings from the Federal Reserve Banks had risen to $1,032,000,000, which is more than double the aggregate at this season in any year since 1921, and $250,000,000 larger than in that year. Brokers' loans as reported by the New York Stock Exchange on June 30 have meantime risen to $4,898,000,000, which is probably at least $3,000,000,000 larger than the unascertained total in 1921, and the supply of gold in the United States has been reduced by about $500,000,000 since August last.

It must be admitted that this summary of the facts does not indicate the probability of cheap money again in the near future, and while 10 per cent was and will continue to be exceptional it seems unlikely that the commercial rate will go much below 6 per cent until there has been a further and a very substantial reduction in the amount loaned against securities.

The total amount so loaned is difficult to ascertain. The Stock Exchange report comprises only the borrowings of its members, and the report of the Federal Reserve Bank of New York includes only the loans made by its member banks. There are, however, many borrowers outside of the New York Stock Exchange and many lenders who are not members of the Federal Reserve Bank of New York. Their contributions to the fund that is being used to finance securities bought for resale must be substantial and while no estimate of the total sum so employed has been made it seems quite possible that it may reach or exceed $6,000,000,000.

It is hard to say what proportion of this amount should be liquidated in order to put the money market back on an even keel, but a reduction of about 7½ per cent during the month of June was reported by the New York Stock Exchange, and at that rate a further curtailment of 25 per cent could be effected by October 15. By that date it should at least be possible to get a better idea of the probabilities, and meantime it would seem to be unwise to anticipate one's consumptive or investment requirements by buying either merchandise or securities with borrowed money.

Of business considered apart from finance it is only possible to generalize. Car loadings for the week ending June 23rd were 4 per cent under last year, but this is about the only new statistical fact that the week brought to light. The magnificent optimism of the automobile manufacturers seems to have fructified in increased sales, but in most other lines, the activity hoped for is still a hope.

At a meeting of the hardware trade recently held the leading speaker said that "Competition has reached a stage which threatens to break down the economic structure," and if their spokesmen are to be believed there are many other industries of which the same statement is true. The cotton textile industry is a conspicuous example. In an effort to bring the output of cotton goods within the demand, curtailment is being resorted to on a scale never before attempted.

Reports from the steel industry are apologetic in respect of the present dullness, but cheerful as to the future. The productive capacity is in excess of the normal demand.

WHAT'S DOING IN INDUSTRY

TAKEN as a whole, the machine tool industry in the United States has just passed through an exceptionally good half year, the best since the War for many, and the industry enters the vacation season with considerable optimism. In Canada, tremendous activity has taken place in all lines since early in the year. A new record has been set in automotive production, industrial construction is setting a fast pace, and large expenditures are being made by the railroads, so that an active third quarter is expected.

IN THE South, conditions have reached a steady level, slightly below normal, but a pickup is expected in the fall. The textile machinery industry still leads in volume of purchases. In Chicago, the high volume of sales of the first six months continues, the leading buyers being manufacturers of farm machinery and tractors.

DETROIT reports a pronounced improvement after a temporary dull period of a few weeks. Ford is the leading buyer, and because of part orders farmed out, small shops are also in the market for machine tools. Cincinnati is also recovering from a slight lull. Inquiries are coming in freely, particularly from the New York territory. There the Wright Aeronautical Corporation dominates the market, and Paterson, N. J., is now the Mecca for machine tool builders from all over the country.

THE aeronautical industry is also exerting considerable influence on activities in New England, where Pratt & Whitney Aircraft holds forth. Industrial activity in the past six months in this territory has been about 20 per cent above that of the last half of 1927. In Indianapolis, also, a leading dealer reports that the period just ended has been the best since the War.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

SOUTHERN DISTRICT

Though machinery and machine tool dealers selling in the southern territory are more or less optimistic over the late summer and fall outlook this season due to general improvement recently in industrial conditions, there has been little improvement in business the past two weeks and there are but few dealers who believe there will be any marked activity during the summer period. It is thought, however, that summer business will be fully as large as last season, and that fall sales will be better than those of last year.

The textile industry continues to be an active buyer of equipment for some of the large new plants that are now being erected in the southeastern district, and for additional units being erected by existing concerns, this business having been better than dealers had expected it would be, ever since the early part of the year.

There is also a good demand still reported for woodworking machinery, mainly from the furniture manufacturing industries in the Southeast, but this business is not nearly as heavy as it was the first four months of the year, though practically on a normal basis. The outlook is for continued normal business during the summer period.

Smaller machine shops are placing but few orders, and as has been the case for several months most of these are for used or rebuilt machinery, with very few such orders reported for new equipment. About the same is true of garage and service station business, though better orders are reported in this field for new machinery.

Some fair contracts for road building machinery have been placed recently by southeastern states, and fair business also is reported in contractors' equipment in the larger cities due to the unusual activity this season in new construction. Railroads continue to place a few scattered orders for heavy equipment, but are not as active as they were earlier in the season.

NEW ENGLAND

New England machine tool and machinery manufacturers, as a whole, have completed a satisfactory six months of business. Compared with the corresponding period a year ago gains are reported averaging around 20 per cent, and all are optimistically inclined regarding prospective business for the balance of 1928. The seasonal summer slump is not expected to reach average proportions. Dealers and builders, at this time, find order balances in better shape than for some years past.

One manufacturer describes industrial conditions in this manner: "Present-day tendencies of more effort and expenditure apply to all lines of manufacture. The industrial units that keep pace with high-speed development, economical production and adequate distribution are finding business satisfactory. Those depending too much on lines largely superseded by improvements are naturally complaining of business conditions."

The aeronautical industry continues to feature activity in the New England section, and buying from this source is bound to be more pronounced in the machine tool field. During the current week the Pratt & Whitney Aircraft Co., Hartford, booked orders for 72 "Hornet" airplane engines at the contract price of $671,620. New airports under construction and being planned in several sections will include machine shops for which general equipment is required.

Three machine tool lists for the City of Boston will be awarded at once. A list is expected for manual training equipment to be placed in a Worcester school. The Fafnir Bearing Co., New Britain, has awarded a contract for a third factory unit, six stories high.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that business is recovering in a satisfactory way from the slight lull previous to the recent National holiday. "Our business has been positively good the past few days," stated one manufacturer. "We had a very good volume of sales the past week, taking the season into consideration," stated another. Other manufacturers report business to have been fair during the week and none report a falling off in the demand.

The great majority of the orders booked in the week were for single tools. The orders were well scattered over the country and well diversified as to sizes and types. Purchases of railroads and concerns in the automotive industry were confined to single items.

Manufacturers report that during the past week inquiries came in freely from all sections of the country, and according to one an increased number have come from New York territory the past few days. Inquiries partook of the same general character as the orders.

Production continues at a normal level for the season and manufacturers report that business on hand and pending will keep plants fairly busy through the summer.

INDIANAPOLIS

According to a prominent dealer, machine tool business as a whole has received more business from Indiana in the past six months than in any other period since the War, and the trade is entering the summer season with the brightest outlook in some years. Most factories have been increasing production. Railroad demand is fair considering the small number of shops of this type in the state.

A disappointment is seen in the demand for machine tools from the automobile trade. The trade the first of the year started out in good shape, but during the last two months has slumped off somewhat. For example, the Marmon plant is down entirely taking inventory and it will be another week before work will be started. Most of the automobile plants are inclined to play very safe in their purchases and in their production. One encouraging feature, though, is the resumption of activities by the local Ford assembly plant. A considerable volume of new machinery was installed and the production of the plant is being increased as rapidly as possible.

The demand from the building trade for special contractors equipment has fallen as weather conditions have been against building, the volume being considerably lower than last year. Some demand is coming, however, for road equipment.

The demand from the steel trade is indifferent. Factories are not operating in excess of the volume of last year and are getting along with old equipment where posible. The American Steel and Wire Co., at Anderson, however, is into capacity production with its welded wire fabric, a new product. Also, more men are now being employed by the Dwiggins Wire Fence Co., than in the history of the industry, and orders are booked far ahead.

CHICAGO

The machine tool market continues to show activity. Not, perhaps, to quite the same degree that has characterized the machinery business for the last three months, but sufficient to render the outlook for July decidedly promising. Inquiries are being received by each mail for tools of all kinds and for every purpose, and in increasing volume. Demand by general industry is being well maintained, and from present prospects as seen by distributors and dealers the month of July this year will not bring the same slump that usually accompanies the advent of the vacation season.

Buying by agricultural machinery plants has slowed up somewhat, but orders for certain lines of equipment still are being received from builders of farm implements and tractors. Railroad buying continues dull, with no new lists in sight. Used tools are in fair demand.

Paralleling the good business that has fallen to manufacturers of and dealers in metal working machine tools, makers of wood working machinery report that trade in their line has been maintained on a good level for the last several months, June winding up the first half of the year with a record better than that of the same month last year.

CANADA

Demand for machinery and machine tools in Canada is holding up exceptionally well. Orders on books and in prospect give promise of an unusually active third quarter. Indications are that the railways will be in the market from now on for heavy supplies and equipment. The Canadian National Ry. will spend $25,000,000 on additions and improvements. Approximately $19,000,000 of this will be spent on general betterments to the physical property of the railroad, while $6,000,000 will be spent on the provision of additional passenger and freight cars and on improvements and additions to shops and engine houses. The Canadian Pacific Ry. has been buying heavily since the beginning of April.

A new monthly record for automobile production was established in May when 33,942 cars were produced. This output was 40 per cent over the 24,211 cars made in April and 32 per cent greater than the previous high total of 25,708 cars recorded in May of last year. Conditions generally seem favorable to the industry, production having mounted steadily from the low for the year of 8,463 cars in January to the record output in May.

Construction is setting a pace never before reached. New work actually contracted for and started during June reached the record total of $59,926,100. The total for the year to date, $256,257,300, is greater than that for the corresponding period of last year by 33.9 per cent.

DETROIT

The past ten days have witnessed a pronounced improvement in nearly every phase of the machinery and machine tool trade in the Detroit area. Previous to that time the dealers had looked forward to the slump that usually comes at this time of year. Business had slowed up considerably from its earlier high rate and most of the fac-

tories were beginning to catch up on their orders, which had been far in arrears. Inquiries also dwindled off and it seemed certain that the usual summer depression was at hand.

Now, however, things are beginning to take on a different aspect. Many good-sized orders are coming in for all types of equipment and the nature of the inquiries that are being received is very encouraging. Ford is perhaps the biggest single buyer and though he is not in the market for large amounts of machinery, he is buying consistently. Production on the new car has advanced to more than 2,600 cars a day, it is said, and will be stepped up considerably higher in the near future.

A great many of the other automobile manufacturers are either buying or planning to buy. The small shops are all busy, both the tool shops and the production shops having come into the market recently for equipment.

Thus far this year the record of sales is far ahead of last year and substantially higher than 1926, which was a record year here. Even if the summer turns out to be a dull one, the average for the year will be very good indeed. As things stand now the year will be little short of remarkable for its volume of sales.

NEW YORK

Little change has taken place in the New York territory in the past week, and both the General Electric Co. and the Wright Aeronautical Corporation continue to dominate the market. The former company has for some time been buying equipment to increase production of the domestic refrigerator and in the past week placed orders for a number of presses and automatic screw machines. Inquiries for further tools are now being issued.

The Wright company has cut its immediate requirements in half, since the aimed at production has been dropped to 250 motors per month instead of the 500-550 recently announced. Paterson for some weeks has been the Mecca for machine tool manufacturers and dealers, and at least one enterprising concern has taken up quarters at a near-by hotel. While a few orders were issued by this company during the holiday week, no real buying was expected until this week, beginning July 9. It is understood some orders for milling machines were placed.

As has been the case for some time, there is still considerable business pending from miscellaneous sources, and most dealers and factory representatives are entering July with considerable optimism. Railroad purchases are conspicuous by their absence, although the N. Y. Central R.R. issued a few inquiries in the past week.

The Pratt & Whitney Co. has just completed the most active month this year, although orders in the past week fell off somewhat. Tools sold included a 16-in. lathe, two 14-in. vertical surface grinders (one rebuilt), three 5-in. hand millers and a centering machine. The Niles Tool Works Co. sold a 40-in. Maag gear generator to a concern in Phfladelphia.

Instrument Companies Merged

Manning, Maxwell and Moore, Inc., of New York, has purchased the American Schaeffer and Budenberg Corporation, of Brooklyn, N. Y., and Worcester, Mass., from Ralph Jonas and his associates. The newly acquired company, founded in 1851, is the oldest and one of the largest manufacturers of industrial instruments in the United States. The business of this company will be co-ordinated with that of the Consolidated Ashcroft Hancock Co., Inc., manufacturer of valves, and indicating and recording instruments, and also owned by Manning, Maxwell and Moore, Inc. The operation of the Brooklyn and Worcester factories of American Schaeffer and Budenberg Corporation will be taken over at once. The purchase price was not disclosed, but it is understood that there will be no public financing.

Atlanta Advertising Campaign Attracts Industry

The value of industrial trade papers as an advertising medium is very well evidenced in the unusual success of the national campaign of the city of Atlanta to attract new industries and business establishments to the Atlanta community. A report issued recently by Eastman, Scott & Co., Atlanta, the agency in charge, shows that in 1925, the year before the campaign started, new firms locating in Atlanta added approximately $366,000 per month to the payrolls of the city, whereas for the first six months of this year new concerns locating in the city have added more than $1,000,000 per month to Atlanta's payrolls. Incidentally, it is the largest trade paper community advertising campaign that has ever been conducted.

Since the campaign started early in 1926, nearly four hundred new concerns have located in Atlanta employing over 12,000 persons, and having an annual total payroll of approximately $22,000,000. It might be added, too, that of the new firms locating in Atlanta during the past three years several include southern distributing branches opened by machinery and machine tool manufacturers of the eastern and middle western territory.

Consumption of Babbitt Metal

The total apparent consumption of babbitt metal in May, based on reports reecived by the Department of Commerce from 31 firms, was 4,606,899 lb. as compared with 4,842,656 in April and 4,945,705 in May, 1927. This consumption is calculated from sales by manufacturers and consumption by those firms (among them several important railroad systems) which consume their own production.

Dealers Protest Freight Rates

Machinery and machine tool dealers and distributors of Miami, Fla., have filed a number of complaints protesting against the freight rates on machinery from all sections of the United States to Miami, contending that the rates are excessive and tend to make the selling price of machinery and tools in the South Florida territory too high. Hearings were held recently by an examiner of the Interstate Commerce Commission at Miami, and the commission has now taken the case under advisement.

American Standards Association to Succeed A.E.S.C.

Reconstruction of the American Engineering Standards Committee to keep pace with the growth of the industrial standardization movement in the United States is now under way, according to an announcement by the Committee. The principal features of the reconstruction are the definite federation of national organizations, under the name American Standards Association, in such a way that trade associations interested in standardization may more readily join in the direction of the movement; placing the technical work of approving standards in a Standards Council; and concentrating administrative and financial responsibility in a Board of Directors composed of twelve industrial executives.

The reorganization has been unanimously approved by the main committee of the A.E.S.C., and is now being voted upon by the member bodies. The action of the Committee results from more than a year's intensive consideration of the subject by the main committee and rules committee. The latter was enlarged for the purpose to include a representative of each of the 19 member-bodies desiring representation.

Among the conditions which led to the reorganization, are the growth of the trade association movement together with the predominating position which the trade association is coming to have in the field of industrial standardization; and the increasingly important direct part which the plant executive is playing in the standardization activities within his plant and in the movement as a whole. A board of directors will control the general administrative and financial affairs of the association, and the industrial executives composing this board will be elected on nomination of member-bodies for three years.

Approval of standards and matters of procedure will be in the hands of a Standards Council.

The name American Standards Association is being adopted as more accurately descriptive of the reorganized association, and also because of the misunderstandings and misconceptions that have frequently occurred in connection with the words "engineering" and "committee."

The objects of the Association, as stated in the new constitution, will be: to provide systematic means by which organizations engaged in industrial standardization work may co-operate in establishing American Standards in those fields in which engineering methods apply, thus avoiding duplication of work and the promulgation of conflicting standards; to serve as a clearing house for information on standardization work in the United States and foreign countries; to further the industrial standardization

movement as a means of advancing the national economy, and to promote a knowledge of, and the use of, approved American industrial and engineering standards, both in the United States and in foreign countries; and to act as the authoritative channel in international co-operation in standardization work, except in those fields adequately provided for by existing international organizations.

Business Items

The Bethlehem Shipbuilding Corporation, Ltd., has bought the Atlantic works of East Boston and will modernize it and combine it with its Simpson plant in the vicinity.

The general purchasing department of Remington Rand, Inc., will be located in the Remington Rand Bldg., 465 Washington St., Buffalo, N. Y., after July 16, L. Rayburn, director of purchases, announces.

The Gibb Welding Machines Co., of Bay City, Mich., manufacturer of arc, spot, seam and butt welders, has increased its capital stock by $125,000, or to double the previous figure.

Directors of the Yale & Towne Manufacturing Co., Stamford, Conn., have declared a dividend of $1 per share out of past earnings to be paid October 1 to stockholders of record September 7.

The Young Radiator Co., Racine, Wis., has received a 1-year contract from the Chicago Pneumatic Tool Co., with plants at Franklin, Cleveland and Detroit, for the manufacture of the latter's complete line of radiators used for portable compressors.

The Manitowoc Engineering Works, a division of the Manitowoc (Wis.) Shipbuilding Corporation, is to manufacture and sell the crane previously made by the Moore Speed Crane Co., of Chicago. The Moore company will continue to act as agents in the Chicago territory.

The Moore Manufacturing Co. of Waterloo, Iowa, has acquired major portion of the dies and patents of the bankrupt Waller Manufacturing Co. another Waterloo concern, from F. J. Eighmey, receiver. The Moore concern makes automobile trunks, bumpers, heaters and similar accessories.

The Eanes Manufacturing Co. was recently organized and incorporated at Asheville, N. C., with a capital stock of $200,000 by H. P. Eanes, 10 Manly Ave., Woolsey, N. C., for the manufacture of textile machinery. It is reported the company will establish a new plant at Asheville.

The Cleveland Duplex Machinery Co., Inc., has been appointed exclusive agents in the northwest Ohio territory for the Grant Manufacturing & Machine Co., of Bridgeport, Conn., in the sale of Grant rivet spinners, threading and chamfering machines and special machinery.

The Underwood-Elliott Fisher Co., Hartford, Conn., has acquired the Underwood Computing Machine Co., the sale of which has been approved by stockholders. An exchange of 30,630 shares of Underwood-Elliott Fisher for 27,774 shares common and 500 shares of preferred stock of the Underwood Computing Machine Co. will be effected.

Edward C. Purvis & Son, of Brooklyn, N. Y., has purchased the plant of the Bucyrus Road Machinery Co., formerly the Carroll Foundry, of Bucyrus, Ohio. The plant has been idle for five years, during litigation following bankruptcy of the Bucyrus company in 1923. The new owners will manufacture engines, air compressors and weaving machines.

Machinery is being moved into the new round house of the Big Four R.R. at Anderson, Ind. The plant will be in service soon, and the old round house will be dismantled. Machinery is being purchased to stock the shops connected with the roundhouse which are larger than the old shops. With the new equipment and buildings it will be possible to do heavy repair work.

Plans for marked expansion of the Construction Machinery Co., Waterloo, Iowa, are being worked out by directors of the company, who recently authorized capital increase from $400,000 to $750,000, according to H. B. Lichty, president. The company specializes in cement-mixing machinery, having been launched in 1909 with $50,000 capital, expanding gradually until it now approximates a million-dollar business with world-wide distribution.

The Wickwire Spencer Steel Co., New York, and its subsidiary, the American Wire Fabrics Corporation, opened a new southeastern branch in Atlanta on July 2 at 161 Spring St., N. W., moving the branch from Jacksonville, Fla., where it has been located for some years. J. E. McGraw, manager of the former branch at Jacksonville, will continue in charge of the Atlanta branch, from which Georgia, Florida, Alabama, South Carolina and East Tennessee will be covered.

Announcement is made by the Van Dorn Electric Tool Co., of Cleveland, Ohio, that its sales branches in Los Angeles, San Francisco, and Seattle, and their service branches in Los Angeles, Oakland and Seattle, have been supplemented by the establishment of a complete warehousing and service depot at 525 E. 10th St., Oakland, Calif. A complete stock of both Van Dorn and Van Norman products will be carried in the Oakland warehouse, and all Pacific Coast shipments made direct from that point. The sales departments will be operated separately.

Appointment of a receiver for the McFarlan Motor Corporation, Connersville, Ind., is asked in a petition filed in Federal court on behalf of the Yale Woolen Mills, of Yale, Mich. The petition declares that the automobile company owes the woolen mill $13,434.40 for supplies and that the debts of the company total $200,000. The petitioner declares that the business of the motor corporation gives no indication that payment of these unsecured claims may be expected and the appointment of a receiver is necessary to safeguard the creditors and that the management of the company has been disrupted since the death, March 30, of Burt Barrows, who as vice-president had directed the business.

Personals

JAMES LENAHAN, purchasing agent of the Link Belt Co., Nicetown, Pa., is sailing on July 21 for Europe.

E. R. WEGENER, formerly in the steel and forging division of the Ford Motor Co., Detroit, has been appointed general manager of the Detroit Forging Co., Detroit.

LUDWIG KEMPER has been made president of the Cincinnati Ballcrank Co., Cincinnati, to succeed Clifford Green, now chairman of the board.

E. E. STOKES, general manager of the Sebastian Lathe Co., Cincinnati, has just returned from a European trip. He spent six weeks visiting France, Germany, Belgium and England.

T. H. SCAFFE has been appointed Detroit district manager of the United States Electrical Tool Co., of Cincinnati. R. N. Brayer has been added to the staff of the Detroit office.

H. E. HENRY is now representing the Ex-Cello Tool & Manufacturing Co., of Detroit, in Cleveland. He is also in charge of sales for the Active Machine & Tool Co., of Cleveland.

THOMAS W. LAMONT, a member of the firm of J. P. Morgan & Co., has been appointed chairman of the American Committee of the International Chamber of Commerce, to succeed Owen D. Young.

R. W. HOYT, formerly with Alfred Gardner & Co., has recently joined the sales organization of Foote Bros. Gear & Machine Co., of Chicago. He will cover the territory on the south side of Chicago from Roosevelt Rd. south to 63rd Street.

M. F. LIEBERMAN, Ambridge, Pa., was elected president of the Sheet Metal Contractors' Association for Pennsylvania at the recent annual convention in Erie.

LUCIUS M. WAINWRIGHT, head of the Diamond Chain Co., of Indianapolis, and O. B. Iles, president of the International Machine Tool Co., have been named vice-presidents of the Morris Plan Co. of Indianapolis.

D. S. MAIR, for seventeen years manager of the Houston office of Joseph T. Ryerson & Son, Inc., has organized the D. S. Mair Machinery Co., 505 Esperson Bldg., Houston, Tex. The company will handle the machine tool line only of Ryerson: Victor taps and bolt and pipe threading machines of the Landis Machine Co., of Waynesboro, Pa.; and other machine tools.

Obituaries

JOHN A. JOHNSTON, for many years connected with the Steel Co. of Canada, died on June 30 in Montreal. At the time of his death, he was superintendent of the bolt and nut factory of the Steel Co. of Canada, having been connected with that company for many years.

CHARLES T. STRAWBRIDGE, 70 years old, vice-president of the Bass Foundry and Machine Co., of Fort Wayne, Ind., died recently following an illness of several months. He entered the employ of the Bass company as a clerk and later became secretary of the company. In 1900 he was made vice-president.

Forthcoming Meetings

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

National Safety Council. Seventeenth annual safety congress will be held in New York, October 1-5. Idabelle Stevenson, executive secretary, 1 Park Ave., New York.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Welding Society. Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals, Division of American Institute of Mining and Metallurgical Engineers. Annual fall meeting during National Metal Week, Oct. 8-12, Benjamin Franklin Hotel, Philadelphia. W. M. Corse, secretary, 810 18th St., N. W., Washington, D. C.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

American Management Association. Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

DISCOUNTS on rubber transmission belting are up five points on first quality, and ten points on second, at New York warehouses this week. The decline in belting and slight lowering of prices for tin and zinc products, constitute the principal changes of the last seven days. Most of the other shop materials used in the metal-working industries either remain firm at present levels or tend slightly upward. Pig-iron demand is slow, with No. 2 Fdry., Birmingham, holding at $15.50 per ton. Steel buying continues active in railway, automotive and agricultural implement material, also in pipe and structural shapes. Steel mill operations average 72 per cent of capacity, against 72½ per cent last week and 71 per cent a year ago. The principal hot-rolled steel products remain at $1.85 per 100 lb., f.o.b., Pittsburgh, in large mill lots. This price has held throughout the last month and is about 10c. per 100 lb. above a year ago.

(All prices as of July 6, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$19.69
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	15.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.50	3.25	3.90*
No. 12	2.05@2.15	3.55	3.30	3.95*
No. 14	2.15@2.20	3.60	3.35	4.00*
No. 16	2.25@2.30	3.70	3.45	4.10*
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.45	4.00
No. 22	2.85@2.95	3.90	3.60	4.15
No. 24	2.90@3.00	3.95	3.65	4.20
No. 26	3.00@3.10	4.05	3.75	4.30
No. 28	3.15@3.25	4.20	3.90	4.45
Galvanized				
No. 10	2.90@2.95	4.10	3.70	4.25
Nos. 12 to 14	3.00@3.05	4.20	3.80	4.35
No. 16	3.10@3.15	4.30	3.90	4.45
No. 18	3.25@3.30	4.45	4.05	4.60
No. 20	3.40@3.45	4.60	4.25	4.75
No. 22	3.45@3.50	4.65	4.30	4.80
No. 24	3.60@3.65	4.80	4.40	4.95
No. 26	3.85@3.90	5.05	4.65	5.20
No. 28	4.10@4.15	5.30	4.90	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., steel, butt welded.	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., steel, lap welded.	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; $\frac{1}{8}$, 7.85c.; $\frac{5}{32}$ to $\frac{1}{4}$ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.50
Tin, straits, pigs, New York			49.50
Lead, pigs, E. St. Louis	6.15	New York	7.75
Zinc, slabs, E. St. Louis	6.17½	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	12.50	13.00	14.25
Copper sheets, base	23.50	23.50	23.50
Copper wire, base	20.12½	19.62½	16 75*
Copper bars, base	22.00	22.00	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, high, base	19.25	19.25	19.25
Brass tubing, high, base	24.12½	24.12½	24.12½
Brass rods, high, base	17.00	17.00	17.00
Brass wire, high, base	19.75	19.75	19.75

*At mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	22½@24	24.30
Zinc sheets (casks).....	10.00@10.50	11.00	9.61
Solder (strictly).....	31.50	32.50	31@34

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade.....	76.50
Commercial genuine, intermediate grade.....	53.00
Anti-friction metal, general service.....	31.50
No. 4 babbitt (f.o.b.).....	12.25

Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:

Ingots.....	35.00	Electrolytic.. 37.00	Shot..... 36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	12.87½@13.12½	12.00	11.75@12.25
Copper, heavy, and wire.	12.00 @12.87½	11.25	11.25@11.75
Copper, light, and bottoms	10.75 @11.25	9.75	10.00@10.50
Heavy lead.....	5.00 @ 5.25	5.25	4.50@ 5.00
Tea lead.....	3.75 @ 4.00	3.75	3.50@ 4.00
Brass, heavy, yellow.....	7.12½@ 7.37½	7.75	7.25@ 7.75
Brass, heavy, red.....	10.00 @10.25	10.00	9.50@ 9.75
Brass, light.....	5.62½@ 6.12½	6.25	6.25@ 6.75
No. 1 yellow rod turnings.	8.00 @ 8.25	7.75	7.50@ 8.00
Zinc.....	3.25 @ 3.50	3.25	2.87½@3.37½

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.15½	38.00 per M	.17
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, per lb. in 1 to 4 bbl. lots.....	.11	.105	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal....	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade.....	30–10%	35%	35%
Heavy grade.....	25– 5%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.....	$0.0325	$0.0325	$0.0324
Cold drawn shafting....	per lb.....	.034	.034	.04
Brass rods.....	per lb.....	.17	.17	.1525
Solder (½ and ½).....	per lb.....	.315	.3275	.40
Cotton waste, white....	per lb.....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.65
Machine oil.....	per gal...	.30	.30	.33
Belting, leather, medium.....	off list....	30–10%	31½%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
†Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.25@2.50
Coke, prompt foundry, per net ton..	Connellsville,		3.25@3.75
White lead, dry or in oil...	100 lb. kegs....	New York,	13.25
Red lead, dry.....	100 lb. kegs....	New York,	13.25
Red lead, in oil.....	100 lb. kegs....	New York,	14.75

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1⅛ and 1¼ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., Mare Island—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C. —will receive bids until July 17 for nine motor driven engine lathes and two tool room lathes here.

D. C., Washington—A. L. Flint, General Purchasing Officer of Panama Canal—will receive bids until July 27 for cranes, drills, floor grinders, tool grinders, hacksaw, etc.

Mass., Boston—Schoolhouse Dept., City Hall—metal working machinery for Hyde Park high school.

Mich., Detroit — Atwater Electric Co., 2675 East Atwater St.—lathe for general use.

Mich., Detroit—Michigan Boiler & Sheet Metal Works, 4120 West Jefferson Ave.—equipment for the manufacture of sheet metal products for proposed addition to plant.

Mich., Ecorse (mail Detroit) — Murray Corp. of America, Clay Ave. and Russell St., Detroit — machinery and equipment for heavy stamping department for proposed auto body factory on Great Lakes St. Estimated cost $75,000.

Mich., Ferndale (Detroit P. O.)—Steel & Tubes Inc., H. B. Wick, Pres., W. J. Sampson, Jr., 224 East 131st St., Cleveland, O.—tube making machinery for proposed first unit of factory 1 story, 210 x 500 ft. here. Estimated cost $200,000.

N. J., Elizabeth—Bd. of Education, 417 South Broad St.—will receive bids until July 12 for tools and machine equipment.

R. I., Newport — Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until July 17 for a Universal milling machine here.

Ont., Welland—High School Board, A. B. McLean, Chn.—prices and catalogs on lathes and general vocational shop equipment for proposed 3 story, 70 x 160 ft. school on Dennistoun St. Estimated cost $200,000.

Opportunities for Future Business

Calif., Emeryville—Western Electric Co., 680 Folsom St., San Francisco, Calif., is having preliminary plans prepared for the construction of a factory here. Estimated cost $500,000.

Calif., Oakland—Weaver-Wells Co., 3321 Broadway, will soon award contract for a 1 and 2 story auto service building at Broadway and 29th St. Noted July 5.

Colo., Denver—C. S. Car Iron Works Co., 2501 West Sixteenth St., will build an addition to machine shop.

Ill., Chicago—Anetsberger Machine Shop, 2725 Lincoln Ave., is receiving bids for a 2 story, 37 x 125 ft. machine shop at 3505 to 3509 Elston St. Estimated cost $40,000. B. J. Bruns, 1851 Irving Park Blvd., Archt.

Ill., Chicago—Austin Millwork Co., 933 North Cicero Ave., awarded contract for a 1 story, 125 x 125 ft. shop at 4726 Walton St. Estimated cost $35,000.

Ill., Chicago—Martin Machine Works, 228 Laflin St., awarded contract for a 1 story, 48 x 125 ft. factory at 2234-36 Walnut St. Estimated cost $18,000.

Ill., Chicago—Syndicate, c/o R. B. Kurzon, 105 West Monroe St., Archt., will soon award contract for a 2 story, 140 x 202 ft. auto service building at Michigan Ave. and 26th St. Estimated cost $475,000.

Ill., Kewanee — Kewanee Boiler Corp., awarded contract for a 1 story, 80 x 279 ft. addition to factory. Estimated cost $200,000.

Ind., Muncie—School Comrs., will soon award contract for a 1 story, 100 x 200 ft. school including shops, etc. Estimated cost $150,000. Houck & Smenner, 108 East Washington St., Archts.

Ky., Outwood—U. S. Veterans' Bureau, Room 764, Arlington Bldg., Washington, D. C., awarded contract for the construction of a new shop and storage building at U. S. Veterans' Hospital here. Estimated cost $29,779. Noted June 21.

Mass., Boston—Charles St. Garage Corp., awarded contract for a 2 story, 82 x 100 ft. addition to garage at Cambridge and Anderson Sts. Noted June 14.

Mass., Boston—Packard Motor Car Co., A. MacAuley, Pres., Grand Blvd., Detroit, Mich., will soon award contract for a 4 story, 115 x 235 ft. sales and service station here. A. Kahn Inc., 1000 Marquette Bldg., Detroit, Mich., Archt.

Mass., Hyannis—Robertson Motor Co., School St., Taunton, plans the construction of a garage and repair shop. Estimated cost $50,000. Private plans.

Mich., Pontiac—Fisher Body Corp., General Motors Bldg., awarded contract for a 1 story, 400 x 460 ft. auto body plant. Estimated cost $2,000,000.

Mo., Fulton—Missouri School for Deaf, H. E. Day, Supt., will soon award contract for 3 story, 48 x 98 ft. manual training shops. C. A. Smith, 800 Finance Bldg., Kansas City, Archt. Noted June 28.

Mo., St. Louis—St. Louis Public Service Co., 39th St. and Park Ave., plans altering south bay of west car barn on DeBaliviere Ave. for repair shop and wash house. $73,800.

N. J., Elizabeth—American Copper Products Corp., Bayway, awarded contract for a 1 story, 105 x 480 ft. factory at Laurel St. and Amboy Ave. Estimated cost $80,000.

N. J., Jersey City—American Can Co., 120 Broadway, New York, N. Y., will build a 7 story, 96 x 200 ft. factory at Dey St. and St. Pauls Ave. Estimated cost $275,000. A. B. Heiser, c/o owner, Archt.

N. Y., Brooklyn—Lilly Realty Co. Inc., E. J. Rose, Pres., 105 Court St., had plans prepared for a 2 story, 166 x 274 ft. garage at 11th Ave. and Prospect St. Estimated cost $825,000. P. Preshman, 50 Court St., Archt.

N. Y., Brooklyn—Picvac Construction Corp., C. F. Vachris, Pres., 156 East 4th St., had plans prepared for a 100 x 257 ft. garage at Glenwood Rd. and Schenectady St. Estimated cost $105,000. C. J. W. Muller, 44 Court St., Archt.

N. Y., Brooklyn—Superior Fireproof Storage Warehouse Inc., 8322 5th Ave., awarded contract for a 6 story, 40 x 100 ft. garage factory, and storage building at 64th St. and 8th Ave. Estimated cost $60,000. Noted July 5.

N. Y., New York—Consolidated Gas Co., 130 East 15th St., had plans prepared for a 1 story, 28 x 138 ft. shop and garage at 400 East 22nd St. Estimated cost $40,000. Private plans.

N. Y., New York—R. Kelly, 4376 Carpenter St., had plans prepared for a 1 story, 75 x 150 ft. garage at Bronx Blvd. and 237th St. Estimated cost $40,000. J. P. Boyland, 305 East Kingsbridge Rd., Archt.

N. Y., New York—Stores Building Co., M. Brenerstock, Pres., 463 7th Ave., had plans prepared for a 2 story, 100 x 277 ft. garage at Brady Ave. Estimated cost $200,000. Shampan & Shampan, 188 Montague St., Brooklyn, Archts.

N. Y., New York—Woodlawn Cemetary, H. C. Smith, Pres., 20 East 23rd St., had plans prepared for a 2 story, 62 x 140 ft. garage and shop at 233rd and Katonah Sts. Estimated cost $100,000. J. R. Ward, 10 West 33rd St., Archt.

N. C., Raleigh—Hiner Supply Co., plans the construction of a foundry and machine shop, etc. to replace fire loss. Estimated cost $40,000.

O., Cleveland—The Eaton Bumper & Spring Service Co., 6515 Carnegie Ave., awarded contract for a 1 story, 42 x 90 ft. factory at 6515 Carnegie Ave. Estimated cost $40,000.

O., Cleveland—The McKinney Tool & Mfg. Co., E. W. McKinney Pres., Arabella Rd., and Roseland Ave., is having plans prepared for a 1 story, 60 x 60 ft. factory, etc. Estimated cost $40,000. E. G. Hoefler, 728 B. F. Keith Bldg., Archt.

O., Cleveland—Superior Screw & Bolt Mfg. Co., N. F. Jones, Pres., 3650 East 93rd St., awarded contract for a 1 story, 107 x 150 ft. machine shop at East 93rd St. and Aetna Rd. Estimated cost $60,000.

O., Cleveland—Triplex Screw Co., A. F. Weber, Prop., 6112 Central Ave., had plans prepared for the construction of a 1 story factory. Estimated cost $40,000. Private plans.

O., Cleveland—Vickek Tool Co., F. J. Vickek, Pres., 3000 East 87th St., awarded contract for a 1 story, 30 x 60 ft. factory and 1 story, 40 x 102 ft. storage building. Estimated cost $40,000.

O., Columbus—Stanton Motors Inc., 841 North High St., is having plans prepared for a 2 story, garage on East Broad St. Estimated cost $85,000. Richard McCarty & Bulford, 584 East Broad St., Archts.

O., Dayton—Four Hundred Seventy Six Tire Co., H. H. Low, Pres., 114 North St. Clair St. plans the construction of a 2 story, 50 x 100 ft. service and repair shops. Estimated cost $150,000. Private plans.

O., Portsmouth—Portsmouth Auto Parts & Wrecking Co., 1121 Findlay St., is having plans prepared for a 1 story, 35 x 76 ft. garage. Estimated cost $40,000. Private plans.

Okla., Wewoka—National Safety Mfg. Co., is having preliminary plans prepared for a 1 story, 100 x 180 ft. factory for the manufacture of safety appliances for oil field work on Cedar St. Estimated cost $100,000. Architect not selected.

Pa., Philadelphia—Hunter Concrete Products Corp., 535 Chestnut St., awarded contract for a 1 story, 40 x 200 ft. shop at School Lane and Ridge Ave.

Pa., Washington—Washington School Board, will soon receive bids for the construction of a junior and senior high school including shops, etc. Estimated cost $605,000. E. B. Lee, Archt., W. G. Wylie, Engr.

Tex., Houston—The Reed Roller Bit Co., Mack Ave. and Ave. Q., awarded contract for the construction of a machine shop. Estimated cost $25,000.

Tex., Saginaw—Gulf, Colorado & Sante Fe R.R., Galveston, is having plans prepared for a switching yard including roundhouse, machine shop, etc. here. Estimated cost $1,000,000. F. Merrill, Ch. Engr.

Ont., Pembroke — Steel Equipment Ltd, Union Bank Bldg., Sparks St., Ottawa, will soon receive bids for addition to factory. Estimated cost $70,000.

Ont., Toronto—Dominion Bridge Co., Reford Bldg., is having plans prepared for a 1 story addition to steel fabricating shop on Sorauren Ave. Estimated cost $150,000. Private plans.

Ont., Toronto—Service Station Equipment Co. Ltd, 510 King St. E., is having plans prepared for a 1 story, 120 x 340 ft. addition to factory on Coxwell Ave. Estimated cost $150,000. D. Brouse, 510 King St. E., Engr.

Ont., Walkerville—General Motors Co. of Canada, H. A. Brown, Mgr., Oshawa, will receive bids about July 14 for a 2 story, 100 x 500 and 80 x 100 ft. bus assembly plant on Howard Ave. here. Estimated cost $250,000. Hutton & Souter, 6 James St. S., Hamilton, Archts.